PRELIMINARY STUDIES ON THE DOTHIDEALES IN TEMPERATE NORTH AMERICA

by

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Introduction

Scope of the study

In the field of mycology at the present time, many of the fungi which are most frustrating to attempt to classify are the Ascomycetes of pyrenomycetous nature. While it is possible to identify many species from descriptions in the literature, the position of these species in respect to one another is difficult to assign. A major step toward a modern classification was provided by Luttrell (1951b, 1955), where he expanded Miller's (1928) and Nannfeldt's (1932) recognition of differences between the subclasses Loculoascomycetes and Euascomycetes and utilized the basic characteristics of the ascus and of centrum development to delimit major groups. Currently, studies of generic types by a number of investigators are providing a firm base for the assignment of taxa to the correct genus. Several systems of classification are available, but none of these is entirely satisfactory. The following synopsis is offered as an alternative arrangement of one order in the Loculoascomycetes. For the present, the system applies to fungi known from temperate North America. The classification probably will have to be expanded and emended as tropical and temperate fungi from other continents are studied. My intention is to continue with similar studies of taxa in the other orders of both Loculoascomycetes and Euascomycetes.

Acknowledgments

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I acknowledge with thanks the cooperation of numerous institutions and the Directors and Curators of the following herbaria for the loan of specimens on which this study is based: the National Fungus Collections, Plant Industry Station, Beltsville (BPI), the California Academy of Sciences, San Francisco (CAS), the Mycological Herbarium, Plant Research Institute, Ottawa (DAOM), the Herbarium of the University of Michigan, Ann Arbor (MICH), The New York Botanical Garden, New York (NY), the Herbarium of the New York State Museum, Albany (NYS), the Herbarium of the University of British Columbia, Vancouver (UBC). My own collections are deposited in the Mycological Herbarium of the University of Massachusetts (MASS).

To the late Dr. L. E. Wehmeyer I am indebted for many suggestions and discussions on the problems of ascomycete systematics. Nomenclatural problems have been discussed with Mr. H. E. Ahles, University of Massachusetts. I would especially thank my husband, Dr. H. E. Bigelow, for his encouragement, patience, and assistance throughout this study. The contributions of my predecessors and colleagues to the systematics of ascomycetes are acknowledged in the body of the paper.

Explanations and Abbreviations

Herbarium designations included in the citations of specimens are the standard designations listed in Lanjouw and Stafleu (1964). Citations of specimens, where possible, are by the collector's name and number. The states or provinces from which

collections have been examined are arranged in sequence from north to south and east to west.

In the interest of conserving space species diagnoses are given whereas full generic descriptions are provided throughout the study. Thus, for details of individual species, both the specific and generic descriptions should be utilized. No claim is made that all species of the region are included; representative species illustrate some of the variations which occur.

The orders of subclass Loculoascomycetes

The Loculoascomycetes embody three major types of development of the ascocarp and the bitunicate ascus (Luttrell 1951b). Each type results in mature ascocarps which can be characterized to aid in classification of the fungi involved. Three orders are recognized here:

Myriangiales: *Elsinoe* developmental type. Ascocarps often irregular in shape, opening irregularly, wall not differentiated. Asci developing singly at various heights or forming a layer, within monascous cavities separated by interthecial tissues.

Dothideales: *Dothidea* developmental type (*Pseudosphaeria* developmental type intermediate between *Elsinoe* and *Dothidea* developmental types.) Ascocarps pulvinate, perithecium-like, hemispherical, or compound, opening irregularly or by defined pore region, the wall varying from undifferentiated to somewhat differentiated. Asci developing in a layer in monascous cavities separated by interthecial tissues, or obliterating the locule tissue and forming a broad layer or a compact fascicle.

Pleosporales: *Pleospora* developmental type. Ascocarps perithecium-like, pulvinate, elongate, hemispherical, or compound, opening irregularly or by a defined pore region or by a slit, the wall usually somewhat differentiated. Asci developing in a layer among pseudoparaphyses which occupy the locule early in development and at maturity may be obvious or indistinct.

Characteristics and their possible evolutionary sequence

Within the Loculoascomycetes, variation in certain characteristics appears to indicate a primitive or a more advanced state of evolution. Ascocarps in which the asci are scattered at various levels are believed to be more primitive than those which are multi- or uniloculate, with each locule containing a number of asci. Uniloculate ascocarps may become grouped and connected by vegetative hyphae, and finally may be so surrounded by stromatic tissue as to give a superficial resemblance to multiloculate ascocarps. Position of the ascocarps in relation to substrate is a variable character and apparently not of evolutionary significance.

Wall structure appears to have evolved from undifferentiated masses of cells (*textura globosa* or *textura angularis*) to compressed layers (*textura prismatica*) which may be differentiated into outer and inner regions. In some groups the surface cells are arranged as *textura epidermoidea* (Starbäck's terminology as emended by Korf, 1958). The surface of the wall may be roughened by protruding cells or by hyphal or setose appendages. So much variation is present that the character can only be utilized to distinguish species.

The simplest type of opening in an ascocarp for dissemination of ascospores is provided by the breakdown of cells above the asci, leaving a rounded, elongate, or irregular hole. More evolved is a definite pore or slit formed by an apical meristematic region. The cells surrounding such an opening differ in shape and orientation from those which form the rest of the wall. A refinement is found in those fungi in which the apical opening is lined by hyaline periphyses or short dark setae.

The locule in the most primitive Loculoascomycetes does not appear to be differentiated from the rest of the ascocarp interior, and asci may develop at various

levels or in a layer separated by sterile cells. More advanced forms have wall and locule tissue somewhat differentiated. Asci arise from a restricted group of ascogenous hyphae in the base of the locule, and compress or dissolve locule cells during their growth. As wall structure becomes more differentiated, so does the locule. This is enlarged by growth of pseudoparaphyses downward from an apical meristematic region, or elongation of cells as the ascocarp enlarges. Ascogenous hyphae in the more advanced forms may be basal or may line the sides of the locule as well. The asci elongate into the locule among the pseudoparaphyses.

The primitive ascus is nearly globose or saccate; more advanced types are broadly oblong or clavate, while in advanced members of the subclass cylindric or clavate and stipitate asci are the rule. The thickness of the double wall, except at the apex, decreases with advancing evolution. Octosporous asci are the rule; formation of fewer than eight ascospores is infrequent, and at times appears to be an accidental occurrence. Polyspory, in multiples of four, occurs in a number of genera. This condition is accepted as a generic criterion in the subclass, as it is among members of the Euascomycetes, e.g. in Coronophoraceae, Diatrypaceae, and Diaporthaceae. The evolutionary significance of polyspory is not known.

The ascospore which is proposed as primitive is globose or ovoid, thin walled, hyaline. Two series of shapes (cf. *Terminology of simple symmetrical plane shapes,* Taxon 11: 145–156, 245–247, *Chart I.* 1962) seem recognizable. Elliptic or obovate is considered to be less advanced than oblong or filiform. Accuracy in description of shape is obtained further by modifications such as narrow or broad, short or elongate, straight or inequilateral or curved, and by defining the obtuse or pointed ends of the ascospore.

Ascospore septation is a classical characteristic which has been used to delimit genera. The primitive condition is the one-celled ascospore. The numbers of species of Loculoascomycetes which have one-celled ascospores are far fewer than those which have septate ascospores, the opposite situation to that occurring in the Euascomycetes.

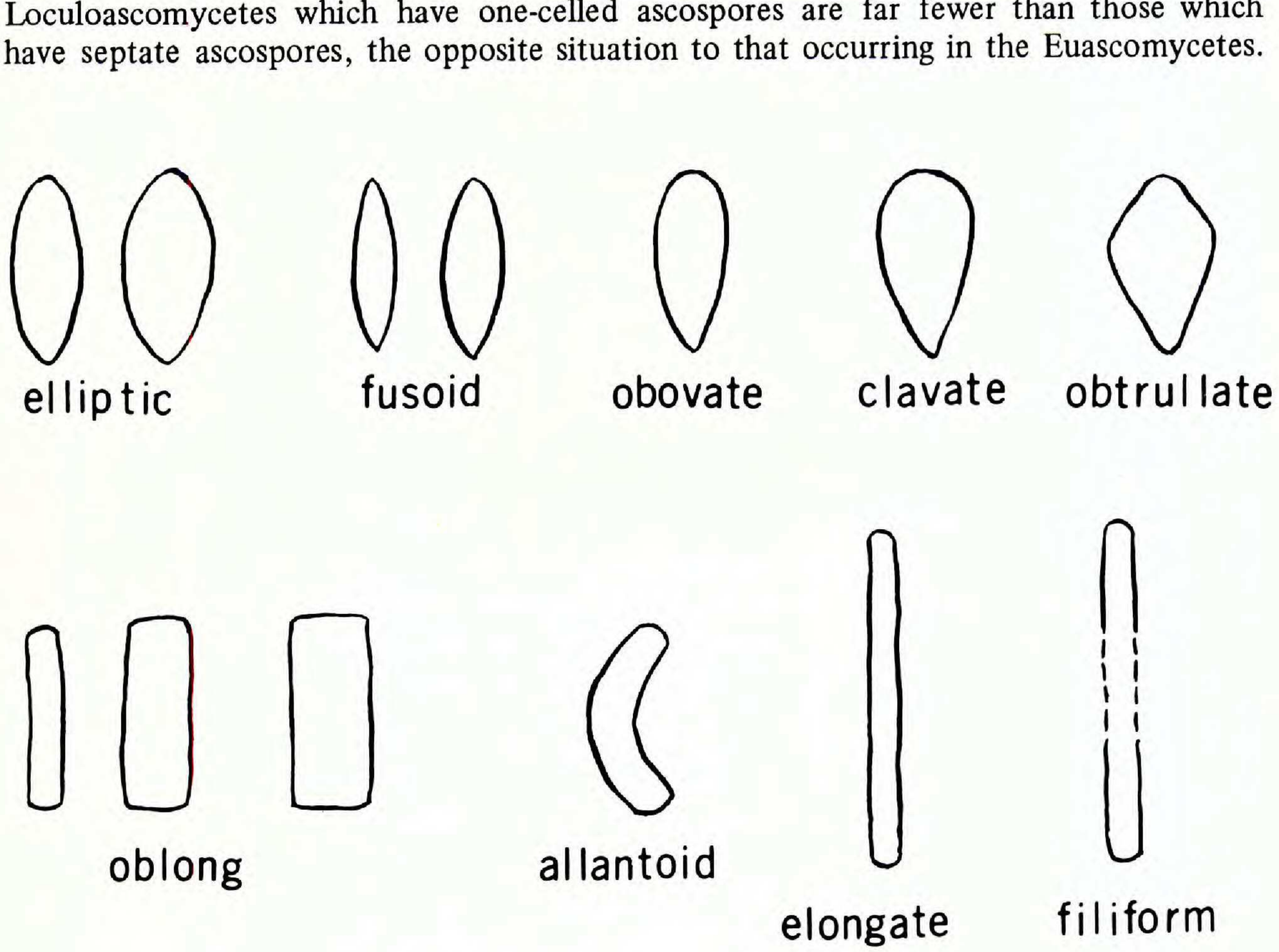

Fig. 1. Ascospore shapes and terminology.

The primary septum may be median, supramedian, or submedian, and frequently the wall is constricted at this septum. Apiospores have a very small basal cell. Secondary and tertiary septa may be inserted in a number of ways, illustrated by Holm (1957) for *Leptosphaeria* and related genera, Wehmeyer (1961) for species of *Pleospora,* and Eriksson (1967) for *Clathrospora.* The formation and insertion of vertical septa is illustrated by the latter two authors.

Hyaline or light colored ascospores appear to be more primitive than deeply pigmented ones. The pigmentation is in the cell contents or is concentrated in the ascospore wall. Ascospores which are hyaline or light colored at maturity may develop a yellowish to dull brown color, but this differs in intensity and tone from the pigment found in dark-spored species. Variations which are of specific value only include wall thickness, smooth or roughened surface, presence of a gelatinous coating or hyaline appendages.

The order Dothideales

The history of the order Dothideales and its vicissitudes throughout the years was provided in some detail by Luttrell (1951b). Luttrell at that time recognized only the families Dothideaceae and Capnodiaceae in the Dothideales. In 1955 he expanded his concept of the order to include the Pseudosphaeriaceae and Dothioraceae. The Herpotrichiellaceae he placed in the Pleosporales. Later (Luttrell, 1965) he suggested raising the Capnodiaceae to ordinal level, and including other fungi of superficial habit within that order.

Müller and von Arx (1950) placed the families Pseudosphaeriaceae, Mycosphaerellaceae, Dothideaceae, and Venturiaceae in the Pseudosphaeriales; the Botryosphaeriaceae, Dothioraceae, Hysteriaceae, and Phacidiaceae they included in the Dothiorales. Their treatment of amerosporous genera (von Arx and Müller, 1954) in the Dothiorales included the families Botryosphaeriaceae, Entopeltaceae, and Mesnieraceae. The latter two families contain no representatives within the regional scope of this study and I do not offer suggestions at present for their classification. The didymosporous genera which belong to the Loculoascomycetes were arranged by Müller and von Arx (1962) in the orders Dothiorales and Pseudosphaeriales; the Phacidiaceae were placed in the Phacidiales (Discomycetes).

From Müller and von Arx's concept of Dothiorales, some families are included in the Dothideales *sensu meo,* i.e. the Dothioraceae and Perisporiopsidaceae. Their Botryosphaeriaceae included genera which belong in the Dothioraceae in my treatment, as well as genera which appear to belong in Myriangiales or Pleosporales. The Hysteriaceae have a *Pleospora* type of development and should be assigned to the Pleosporales. The remainder of the families of Müller and von Arx's Dothiorales seems best placed in the Myriangiales in a broad sense. Their concept of the Pseudosphaeriales differs from mine of the Pleosporales in several instances. Thus, while most of the families which they included in the Pseudosphaeriales are members of the Pleosporales, in my opinion some are not. Their Capnodiaceae and Mycosphaerellaceae, i.e. Dothideaceae (*most* of the taxa) belong in the Dothideales, as do genera which Müller and von Arx placed in the Pleosporaceae such as *Monascostroma, Wettsteinina,* and *Herpotrichiella.* These differences in classification are due particularly to emphasis on the importance of sterile cells, i.e. interthecial tissues or pseudoparaphyses, or the lack of sterile cells, in the locule.

The classification of lichenized fungi should be accommodated within the framework of a general ascomycete classification (cf. Hale, 1961). In this study and through those which are planned to follow, I will attempt to arrange the lichens in the orders to which they are related according to structure of the ascocarp. Recognition of their unique biological status requires that they be retained in a separate family (or families)

within the order to which they belong in the majority of cases. Certain lichenized fungi, however, seem to differ only generically from their non-lichenized relatives, and these latter are accommodated within the non-lichenized family.

Significant characters within the Dothideales

Ascocarps

Following Holm's (1957) discussion of terminology, I am using the term "ascocarp" rather than "ascostroma" or "pseudothecium." The position of the ascocarp in relation to host tissues, i.e. whether immersed-erumpent or superficial, is a generic character within the Pseudosphaeriaceae, Dothioraceae, and Dothideaceae. Members of the Herpotrichiellaceae and Capnodiaceae are superficial on the substrate. Ascocarps are uni- or multiloculate. The characteristic of uni- or multiloculate ascocarps has been stressed at the generic level by many authors. However, it appears to be only a secondary character. Closely related species are known in which the ascocarps are uniloculate and separate, in which hyphae or massed tissue connects several ascocarps, or in which few to many locules are formed within a stromatic mass of tissue.

The ascocarp wall in the Dothideales is composed of cells which in section appear as *textura globosa* or *textura angularis*, or are compressed and form *textura prismatica*. The cells are usually thin walled but occasionally the walls are thickened and sometimes contain pores connecting adjacent cells. Pigmentation is most intense toward the periphery of the ascocarp, less so toward the interior. In a number of genera the cells are vertically oriented in rows; this is evident even at maturity in ascocarps of the Dothioraceae.

The apical opening of ascocarps is relatively simple within the order. In most members of the Pseudosphaeriaceae a small lysigenous pore is formed at maturity. Rarely, a cap-like area may dehisce, leaving a larger opening. The apex of species of the Dothioraceae opens with a small to large pore, or may weather and finally open widely and irregularly. Ascocarps of the other three families open by a small lysigenous pore at the apex.

The locule of immature ascocarps is filled by hyaline cells, either irregular or in vertical rows. Ascogenous cells are formed near the base of the locule, and young asci develop from these and protrude into the locule tissue. In the Pseudosphaeriaceae and Dothioraceae the asci occupy the entire base of the locule. The asci are relatively few in the Pseudosphaeriaceae and remnants of locule tissue (interthecial tissue) remain between them as they mature. When only mature stages of certain of the Pseudosphaeriaceae are available, it is sometimes difficult to determine that interthecial tissue is present. Then ascocarp wall, apical pore, and ascospore structure all must be considered to classify the specimen. The asci are more numerous in the species assigned to the Dothioraceae; at maturity they form a parallel group from the entire base and locule cells are completely obliterated except above the asci. In the other three families, the ascogenous cells are somewhat restricted in the base of the locule. Asci develop as a fascicle from the central part of the base, compress locule cells, and occupy the entire locule.

Asci and Ascospores

The asci of members of the Dothideales vary in shape from saccate, to clavate, or oblong. Those of the Pseudosphaeriaceae are generally broadly oblong or saccate, whereas those of the Dothioraceae are oblong or clavate. In the Dothideaceae, Herpotrichiellaceae, and Capnodiaceae saccate and oblong asci are found. The double wall of the ascus is thickened toward the apex in all members. In some members of

the Pseudosphaeriaceae the cytoplasmic plug at the apex may be surrounded by a refractive ring, but in the other families no refractive ring can be seen. The ascus base is usually foot-like, and except for some of the clavate asci of Dothioraceae, no stipe is present. Ascospore discharge has been observed in a number of species of the order. The outer wall of the ascus ruptures, sometimes at the apex or at times producing a thimble-shaped cap, and the inner wall elongates greatly (to 2–3 times its original length), carrying with it the uppermost ascospores. Normally eight ascospores are produced in each ascus, but at times only four mature, e.g. in *Dothidea puccinioides.* Taxa with polysporous asci are relatively numerous in the families Dothioraceae and Herpotrichiellaceae.

Ascospores of the Dothideales are basically elliptic or obovate. Some variation of shape is found within nearly all genera, although in the Dothioraceae the majority have obovate ascospores. Narrow elongate ascospores approaching filiform are known in *Sphaerulina* and *Polytrichiella.* The ascospores of many genera are hyaline, a number develop yellowish-brown pigmentation as they mature, and some at maturity are rich dark brown. The outer wall is usually smooth in the hyaline-spored species, but when pigmented the wall is frequently finely encrusted. A thick gelatinous coating often surrounds the ascospores of species in the Pseudosphaeriaceae and occasionally of species in the other families. Appendages are formed on the tips of ascospores in a few species of *Botryosphaeria.* The one-celled ascospore is found in only three genera, these belonging in the Dothioraceae and Dothideaceae. One-septate and several-septate or muriform ascospores characterize one or more genera in each family.

Conidial States

Knowledge of the conidial states of fungi belonging to the Dothideales is limited as relatively few connections have bewn authenticated. No generalizations can be made on the value of this character at present. Within the Pseudosphaeriaceae, only *Pyrenophora* is known to produce conidia. These are septate porospores (conidial terminology following that of Barron, 1968) and belong to the genus *Drechslera.*

Conidial states of members of the Dothioraceae may be borne within locules in stromatic tissue or on the surface of stromatic tissue. Where the conidiophores are well developed the conidia are produced successively as blown out ends of new growing points (sympodiospores) as in the *Hadrotrichum* state of *Scirrhia rimosa* or the *Dothistroma* state of *S. pini.* However, the conidiophores of most of the conidial states known in the Dothioraceae are very short and line the walls of locules. These states have been assigned to the form-genera *Dothiorella, Botryodiplodia, Macrophoma,* or *Phyllostictina,* depending on conidial septation and pigmentation. In *Dothichiza,* locule cells appear to be converted into one-celled conidia, or as von Arx (1970) illustrated, the locule cells or hyphae produce blastospores.

In the Dothideaceae species of *Mycosphaerella* have varied types of conidial states. Sympodially formed conidia are produced usually on small fascicles of conidiophores which bear scars at maturity. The conidiophores arise from an immersed stromatic complex of hyphae and are erumpent through epidermal cells or stomata of the host plant. Septation and pigmentation, or the formation of chains of blastospores, dictate the disposition of the conidial states into form-genera: *Ovularia, Ramularia, Cercospora, Cercosporella, Cercosporidium, Isariopsis, Passalora, Polythrincium, Heterosporium,* or *Cladosporium.* Annellate conidiophores are formed in *Stigmina.* Pycnidia are produced by species of *Septoria,* and acervuli by *Lecanosticta.* Conidia in these two genera arise from short sporogenous cells and could be termed blastospores. Species of *Discosphaerina* have associated conidial states produced in pycnidia of the form-genera *Selenophoma* or *Kabatia.* The only species of *Sphaerulina* presently known to have a conidial state is *S. rubi.* The conidial state was described as *Cylindrosporium rubi,* but it scarcely differs from *Septoria.* In a number of species of the Dothideaceae and

Dothioraceae, a microconidial state is also known, and is assigned to *Asteromella* or *Phyllosticta.*

No conidial state is known as yet for species of the Herpotrichiellaceae. The Capnodiaceae have varied conidial states. Pycnidia resembling the ascocarpic state but containing one-celled conidia are found in *Rhytidenglerula* and *Scorias.* Both *Aithalomyces* and *Strigopodia* have hyphomycetous conidial states. Sympodially formed phragmoconidia belonging to *Hormisciella* are associated with species of *Strigopodia,* and apparently also with *Aithalomyces.* In addition, phialides and phialospores are produced from hyphae, ascospores, and conidia of *Aithalomyces* (as *Hormisciomyces*) and of *Strigopodia* (as *Capnophialophora*).

Hosts and Substrates

The substrates of fungi assigned to the Dothideales may be found in all groups of vascular plants and also among nonvascular organisms. In general, the Pseudosphaeriaceae are most numerous on monocotyledonous hosts, but also develop in leaves or stalks of dicotyledonous herbaceous or woody plants, and to a lesser extent on gymnosperms. Members of the Dothioraceae are predominantly inhabitants of a wide variety of woody hosts both angiosperms and gymnosperms. Only a few specimens are found on monocots. The species of Dothideaceae inhabit leaves, stalks, and smaller branches of both woody and herbaceous hosts, of monocots, less often of gymnosperms, and also ferns, lycopods, and algae. In the Herpotrichiellaceae, substrates tend to be old fungi (Basidiomycetes or stromatic Euascomycetes) and much decayed wood, in addition to old woody or herbaceous plant remains. The members of the Capnodiaceae occur on resinous or insect exudates on leaves and branches of gymnosperms and woody angiosperms. Saprobes comprise the majority of species in the Dothideales. Some are known to be obligate parasites; others are facultative parasites beginning their life cycle in living plant tissues but maturing in dead tissues.

Suggested relationships of families and genera.

The relationships of families and genera seem best derived from the trends within a large genus or two central in each family. From the sequences of species in a genus interrelationship between families is extrapolated. Minor genera are envisioned as side lines within each family. In text figure 2 are summarized the relationships which are suggested below.

The Pseudosphaeriaceae include a number of taxa which are indicators of relationship to primitive members of the Myriangiales, to the Dothioraceae, and to the Dothideaceae, and possibly also to the Pleosporaceae of the Pleosporales. This family, as Luttrell (1955) remarked, could almost as well be assigned to the Pleosporales as to the Dothideales. However, the preponderance of characteristics is of the latter order.

From *Wettsteinina,* the central and most variable genus in the Pseudosphaeriaceae, several lines of development can be postulated. Production of numerous oblong to clavate asci in a basal layer and reduction in the amount of interthecial tissue remaining at maturity would yield ascocarps typical of the Dothioraceae. The species of *Wettsteinina* with saccate asci could have given rise to those of *Leptosphaerulina* and *Monascostroma.* Species in *Mycosphaerella* subgenus *Didymellina* are obviously not greatly advanced beyond the latter two genera. A third line of development in *Wettsteinina,* marked by the production of oblong asci well separated by interthecial tissue, leads to *Pyrenophora.* From this line also is an apparent connection to members of the Pleosporaceae, the resemblance particularly striking in young stages of *Pleospora sens. str.* These three lines of development in *Wettsteinina,* based on ascus shape and arrangement in the locule, are the major ones within the genus. Minor characters, such as the development of stromatic tissue in *W. sabalicola* and *W. yuccaegena,* indicate

their relationship to *Dermatina.* This lichenized genus has superficial multiloculate ascocarps and is connected to *Stomatogene. Extrawettsteinina* is distinguished from *Stomatogene* by formation of a differentiated ascocarp wall of somewhat radiating structure.

In the Dothioraceae, *Bagnisiella* is the most primitive genus according to ascus arrangement in the locule. Two parallel lines of development are discernable in the Dothioraceae, both apparently derived from *Bagnisiella. Botryosphaeria* has one-celled ascospores as does *Bagnisiella,* whereas *Dothiora* has septate ascospores. In both, variation occurs in formation of multi- or uniloculate ascocarps and in size and configuration of the locule. With decreasing size of the locule the asci become grouped more closely and parallel arrangement of asci is less recognizable. The extralimital genus *Phyllachorella,* while otherwise similar to *Botryosphaeria,* has asci arising in a small locule from a pulvinate mass of cells. Only minor differences exist between *Phyllachorella* and *Discosphaerina* in the Dothideaceae. Similarly *Saccothecium* deviates from *Dothiora* and *Columnosphaeria* from *Bagnisiella* and these approach Dothideaceae in aspect of the locule. *Scirrhia* could be derived from the compound ascocarps of several species of *Botryosphaeria;* the major distinction between the genera is the formation of one-septate or one-celled ascospores. While having the ascospore type of *Scirrhia, Coccoidella* produces a basal immersed hypostromatic foot which bears a superficial peltate multiloculate stroma. An additional variation in the family is that of polyspory. Both *Scirrhia* and *Dothiora* have polysporous counterparts, *Delphinella* and *Sydowia* respectively. The latter show the same variation in ascocarps and in ascospore septation as do their octosporous counterparts.

In the Dothideaceae *Mycosphaerella* with one-septate hyaline ascospores is the most variable and largest genus. *Didymellina* is the more primitive of the two subgenera of *Mycosphaerella,* and could be derived from one line of development in the Pseudosphaeriaceae. The species of subgenus *Mycosphaerella* may be derived from species in section *Fusispora* of subgenus *Didymellina* (and cf. Müller and von Arx 1950). The varied shapes of ascospores within the genus lead to other genera: from *Mycosphaerella* subgenus *Mycosphaerella* by way of section *Longispora*, the species of *Sphaerulina* derive by more elongate ascospores which develop additional septa. The species of *Dothidea sens. str.*, with brown ascospores and multiloculate ascocarps could be related to such species as *M. tassiana. Omphalospora* could possibly be derived from closely related species in *M.* subgenus *Didymellina,* e.g. *M. minor.* The presence of radiating mycelium beneath ascocarps of *M. minor* differs in lesser quantity from the stromatic tissue found in *Omphalospora.* In the latter ascospore septation—apiospores—is distinctive. Ascospore septation is of little assistance in considering the derivation of *Rhizogene* and *Lasiobotrys.* In these two the septum is supramedian and pigmentation is present but not heavy. The similarities of stromata and locules between *Dothidea* and *Rhizogene* would seem to link them, while ascospore type links *Rhizogene* with *Lasiobotrys.* These two genera approach the Venturiaceae of the Pleosporales in a number of characters. *Discosphaerina,* as was noted earlier, appears to be connected by way of *Phyllachorella* to *Botryosphaeria* in the Dothioraceae and is also closely related to species of *Mycosphaerella.*

The taxa in the Herpotrichiellaceae as emended here are too few to provide any definite views on their relationship. They are all similar in locule aspect to *Mycosphaerella,* differing especially in superficial habit and by the dingy pigmentation in the ascospores and ascocarp wall. Within the family, both octosporous (*Herpotrichiella*) and polysporous (*Capronia*) genera are recognized in the group whose ascospores are several-septate and often muriform. The elongate ascospores of species in *Polytrichiella* seem to indicate an end line from *Capronia.*

The emendation of the family Capnodiaceae to exclude those with a *Pleospora* developmental type of locule leaves relatively few representatives in this regional

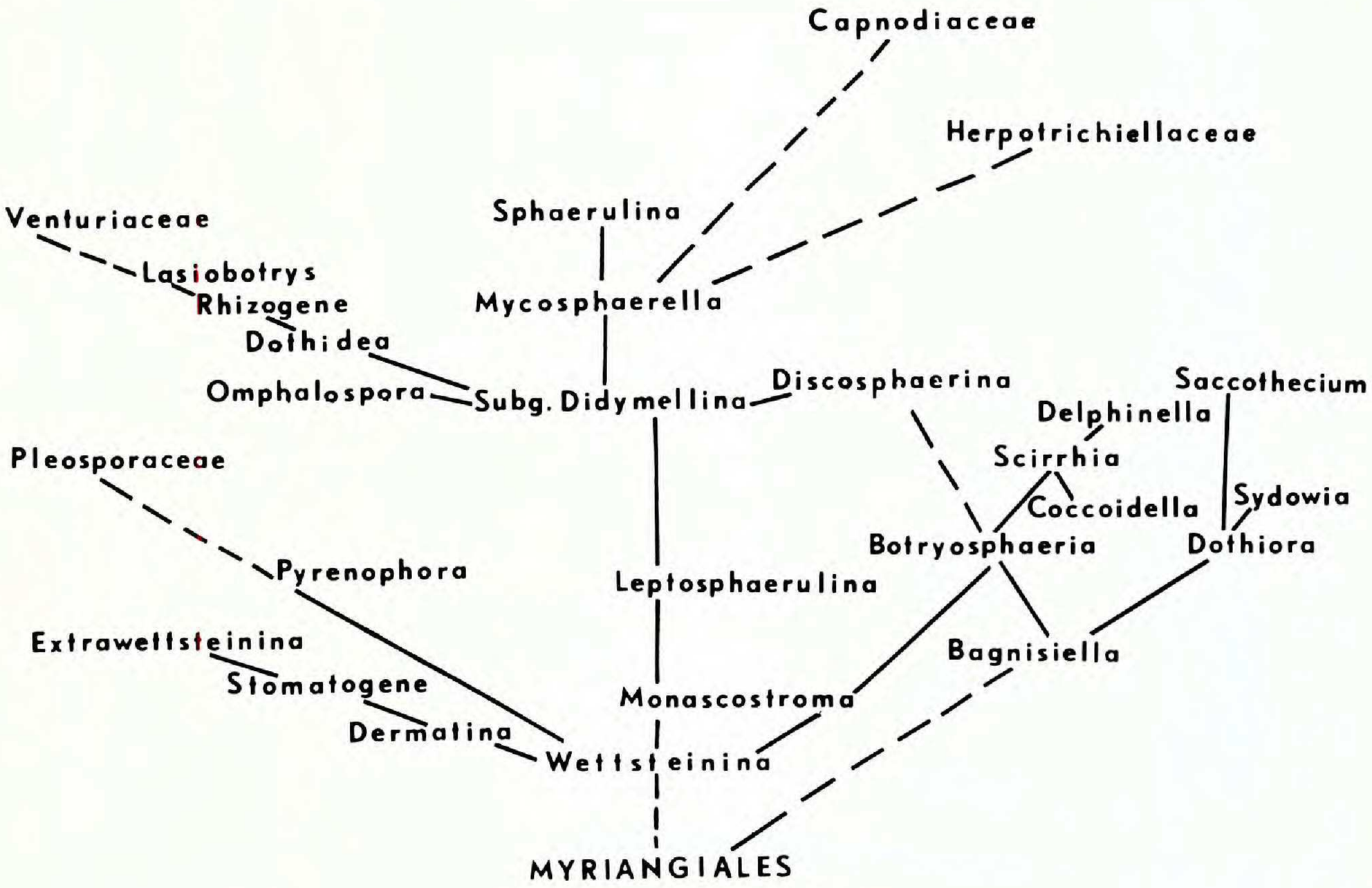

Fig. 2. Suggested relationships among families and genera of the Dothideales.

treatment. The unusual habitat, i.e. plant exudates, is an adaptation which cannot be traced presently. The north temperate species of Capnodiaceae comprise only a small percentage of the existing species and much research on extralimital taxa is necessary. The aspect of the locule is of members of the Dothideaceae. *Rhytidenglerula* deviates from the other members of the family in having light colored ascocarp wall and sparse, light colored subiculum, but is allied to *Aithalomyces* and *Strigopodia* by aspect of the depressed ascocarp, and to *Scorias* by pycnidial conidial state.

CLASSIFICATION

Dothideales Lindau in Engler & Prantl, Natürl. Pflanzenfam. I(1): 373. 1897, emend.
Pseudosphaeriales Theiss. & Syd. Ann. Mycol. 16: 6. 1918, pro parte
Capnodiales Woronichin, Ann. Mycol. 23: 178. 1925, pro parte
Dothiorales Müller & von Arx, Ber. Schweiz. Bot. Ges. 60: 389. 1950, pro parte

Key to Families of Dothideales

1. Asci developing in and separated by interthecial tissues; ascospores usually surrounded by gelatinous coating. *Pseudosphaeriaceae.*
1. Asci developing in a broad layer or a fascicle and dissolving locule tissue; ascospores rarely surrounded by gelatinous coating.
   2. Asci parallel in a broad layer from entire base of locule, or from conic or columnar basal cushion, clavate or oblong, usually short stipitate; ascocarps depressed or globose, rarely conic, opening by relatively large pore or by irregular wearing away of apex; ascospores usually containing many minute guttules. *Dothioraceae.*
   2. Asci in a fascicle from a basal cushion, saccate or oblong, usually sessile or nearly so; ascocarps variable in shape, opening by relatively small pore; ascospores usually containing one or two globules per cell.
      3. Ascocarps originating within plant tissues, often becoming erumpent but with immersed hyphae or hypostroma. *Dothideaceae.*

3. Ascocarps originating on surface of substrate; hyphae rarely penetrating substrate.
   4. Hypersaprobic on decaying plant material or old fructifications of other fungi; hyphae narrow; ascospores and often ascocarp walls tinged grayish or dull olivaceous. *Herpotrichiellaceae.*
   4. Epiphytic on living or dead plant material, often over honey-dew secretions from insects; hyphae usually broad; ascospores and ascocarp walls not tinged grayish or dull olivaceous. *Capnodiaceae.*

Pseudosphaeriaceae v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss., Math.–Naturwiss. Kl. Abt. I, 116: 129. 1907.

= *Parodiellinaceae* Arnaud, Asterinées, Thés. Paris, sér. A. No. 805: 21. 1918.
= *Parodiellinaceae* Hansford, Mycol. Pap. 15: 15. 1946.
= *Parodiopsidaceae* Luttrell, Univ. Missouri Stud. Sci. Ser. 24(3): 78. 1951.
= *Perisporiopsidaceae* Müller & von Arx, Beitr. Kryptogamenfl. Schweiz 11(2): 167. 1962.

Ascocarps uni- or multiloculate, immersed and becoming erumpent, or superficial, globose, conic, or depressed, separate or occasionally seated on hypostroma or massed together by connecting hyphae; wall thick or thin, with layers of large cells forming *textura angularis* or *textura prismatica,* the surface glabrous, setose, or with hyphal appendages, the latter sometimes conidiophorous; ascocarps opening at maturity by a small to irregular pore, rarely dehiscing at apex to leave a large opening. Asci arising from entire base of locule, saccate, oblong, or clavate, bitunicate, (4–) 8-spored, in interthecial tissues. Ascospores hyaline, yellowish, or brown, elliptic, obovate or oblong, one- to several-septate, a vertical septum frequently developed in several cells; contents homogeneous or as one or two rounded or rarely lenticular globules per cell; wall smooth or roughened, often surrounded by a gelatinous coating; spores overlapping biseriate or crowded in the ascus.

Conidial state where known hyphomycetous: *Drechslera* porospores.

On monocotyledonous leaves and culms, leaves and stalks of herbaceous or woody dicotyledonous plants, and on conifer leaves.

The family Pseudosphaeriaceae as it is interpreted here includes both immersed-erumpent and superficial taxa. This is the position which Luttrell (1955) took also. The few temperate North American representatives of superficial taxa previously assigned to Parodiellinaceae or Parodiopsidaceae or Perisporiopsidaceae are similar in internal structure to the immersed representatives of the family such as *Wettsteinina.* This family will probably be expanded considerably when extralimital taxa are studied and their relationships determined.

Key to Genera

1. Ascocarps superficial on host tissues.
   2. Ascocarps on thin crustose lichen thallus; ascospores muriform. *Dermatina.*
   2. Ascocarps not on lichen thallus; ascospores transversely septate.
      3. Ascocarps globose or depressed, walls of equal thickness, *textura angularis,* surface often roughened or short appendaged; ascospores 1 (–3)-septate. *Stomatogene.*
      3. Ascocarps conic, basal layer narrow, side wall of *textura prismatica,* surface smooth; ascospores 3–6-septate. *Extrawettsteinina.*
1. Ascocarps immersed in and often erumpent from host tissues.
   4. Ascocarps small, the wall thin; gelatinous coating around ascospores thin when present.
      5. Ascocarps depressed globose or conic; ascospores 1-septate, rarely 2–3-septate in age. *Monascostroma.*
      5. Ascocarps globose or conic; ascospores several-septate, at times vertical septum in one or more cells. *Leptosphaerulina.*
   4. Ascocarps medium-sized to large, the wall relatively thick; gelatinous coating around ascospores thick when present.
      6. Ascocarps middle-sized to large, wall rather thick, glabrous or setose. *Wettsteinina.*
      6. Ascocarps large, wall thick and sclerotial, usually setose or with conidiophores. *Pyrenophora.*

Stomatogene Theissen, Ann. Mycol. 14: 406. 1916.

Ascocarps globose or depressed, separate or grouped, superficial on dull blotches or spots formed by thin weft of dark brown mycelium whose hyphae penetrate leaf tissues through stomatal openings; superficial hyphae appressed, with upright tapering branches; wall of two to three layers of coarse, blackish brown cells with bluish tinge, *textura angularis,* roughened externally by protruding cells, often with hyphal appendages; wall cells smaller and lighter brown around inconspicuous apical pore. Asci ovate or oblong, few in interthecial tissue which is compressed between asci, bitunicate, sessile, the base foot-like. Ascospores overlapping biseriate to crowded in the ascus, obovate or elliptic, hyaline becoming brown, straight or slightly curved, 1 (–3)-septate, constricted at primary septum; contents globular; wall roughened at maturity, surrounded by a thin gelatinous coating.

Conidial state not known.

Weakly parasitic in spots in thick living leaves of monocotyledons; southern United States and tropical regions.

Müller and von Arx (1962) included this genus in the Perisporiopsidaceae, with which they replaced the Parodiellinaceae sensu Hansford (1946). Locule structure in the two species known is typically pseudosphaeriaceous.

Type species: *S. agaves* (Ell. & Ev.) Theissen.

Stomatogene agaves (Ell. & Ev.) Theissen, Ann. Mycol. 14: 406. 1916. Figures 1–3.

≡ *Asterina agaves* Ell. & Ev. Bull. Torrey Bot. Club 27: 571. 1900.
≡ *Dimerium agaves* (Ell. & Ev.) Rehm, Ann. Mycol. 12: 170. 1914.
= *Dimerosporium agavectona* Pat. & Har. Bull. Soc. Mycol. France 28: 282. 1912.

Ascocarps 110–135(–220) μ diam, 80–135 μ high, grouped on blotched spots on leaves; superficial mycelium dark brown, appressed and with erect branches, the hyphae penetrating stomatal openings but not extending deep into leaf tissue; wall 15–20 μ thick, the surface roughened with hyphal appendages and protruding cells. Asci 40–50 × 20–30 μ, ovate or oblong. Ascospores 20–28 × 6–9 μ, obovate approaching clavate, straight; septum supramedian, constricted, the upper cell broader and shorter than the lower.

On leaves of *Agave* spp., subtropical and tropical North America.

Material examined:

Dominican Republic: *R. Ciferri 2842* (NY). Mexico: *Rehm, Ascom. 2102* (NY, as *Dimerium*), *Kryptogamae exs. 2210* (NY, as *Dimerium*); *Rose,* Plants of Mexico *13063* (NY, as *Asterina*).

Additional species:

Stomatogene yuccae Hansford, Sydowia 11: 68. 1958 ["1957"].

Ascocarps 180–220 μ diam, 155–180 μ high, grouped, at times forming concentric circles on slightly raised dull brown leaf spots; thin weft of superficial mycelium appressed, with occasional erect branches, the hyphae penetrating deep into leaf tissue; spotting caused by reaction of host cells and resulting in reddish-brown cell contents; wall 15–20 μ thick, the surface roughened by protruding cells and occasional short hyphal appendages. Asci 60–80 × 20–30 μ, oblong or ovate. Ascospores 25–35 × 7–10 μ, obovate, straight to slightly curved; septum nearly median, slightly constricted; secondary septa formed in each cell in age but not constricted.

On leaves of *Yucca mohavensis* Sarg., *Y. whipplei* Torr., southwestern North America.

Material examined:

California: *Calif. Fungi 576* (isotype), *577* (NY). (Holotype in Herbarium of University of Illinois.)

The broader, darker brown ascospores of this species frequently become three-septate at maturity, whereas those of *S. agaves* remain one-septate.

Extrawettsteinina Barr, gen. nov.

Ascocarpia superficialia, conica, basi applanata, peridio tenui. Asci saccati, bitunicati, in contexto intertheciali pauci. Ascosporae hyalinae, maturitate fulvae vel brunneae, ellipticae vel obovato-clavatae, transverse septatae.

Saprophyticus insidens foliis emortuis.

Species typicum: *E. minuta* Barr, sp. nov.

Ascocarps superficial on substrate, conic, the base applanate; basal wall thin, light brown, *textura epidermoidea,* the side walls thin, the surface cells *textura prismatica,* radiating from small apical pore. Asci saccate, few in interthecial tissue, bitunicate. Ascospores crowded in the ascus, elliptic or obovate-clavate, hyaline, dull brown at maturity, transversely septate, usually constricted at the septa; contents with one large globule and small guttules in each cell; wall smooth; gelatinous coating thin when present.

Conidial state not known.

Saprobic on dead leaves of gymnosperms and angiosperms; temperate North America, Europe.

The diagnostic features which distinguish *Extrawettsteinina* are those utilized in the key to genera: the formation of conic ascocarps superficial on the substrate and the radiating arrangement of wall cells. Ascospores in the three species presently recognized are of two types. In *E. minuta* and *E. mediterranea* the ascospores are broadly elliptic and constricted at all septa. These ascospores are similar to those of species in *Wettsteinina* section *Massarioidea.* On the other hand, the ascospores of *E. pinastri* are clavate and have the primary septum supramedian, much as in the species of *Wettsteinina* section *Pseudosphaeria* or in *Leptosphaerulina pulchra.*

Extrawettsteinina minuta Barr, sp. nov. Figures 4–6.

Ascocarpia 100–115 μ diametro, conica. Asci 54–69 × 24–27 μ, bitunicati. Ascosporae 21–24 × 8–9 μ, hyalinae vel fulvae vel brunneae, ellipticae, 3-septatae, ad septa omnia constrictae.

Specimen typicum insidens foliis *Juniperi communis,* prope "trail to Lac Diable, Mont Albert, Gaspé Prov. Park, 19 Aug 1957" a *M. E. Barr* n. *2194* lectum, in herbario Univ. Mass. depositum.

Ascocarps 100–115 μ diam at base, conic, tapered from broad applanate base to apex; wall thin, light brown at base, blackish brown at sides. Asci 54–69 × 24–27 μ, occasionally with refractive ring surrounding cytoplasmic protrusion at apex. Ascospores 21–24 × 8–9 μ, hyaline, dull brown in age, broadly elliptic, straight, equally 3-septate, constricted at all septa, surrounded by a narrow gelatinous coating.

On dead leaves of *Juniperus communis* L., eastern North America.

Material examined:

Quebec: *Barr 2194* (holotype, MASS). Vermont: *Barr 4278* (MASS).

The ascospores of this species are quite similar in shape to those of *Wettsteinina mediterranea* E. Müller, which is larger in all respects. According to the description and figures, that species is also a representative of *Extrawettsteinina* and the new combination **E. mediterranea** (Müller) Barr is proposed. (Basionym: *Wettsteinina mediterranea* Müller, Sydowia 18: 92. 1965. ["1964"]). *E. mediterranea* was described from dead leaves of *Quercus ilex.*

Additional species:

Extrawettsteinina pinastri Barr, sp. nov. Figures 7–8.

Ascocarpia 100–200 μ diametro, conica. Asci 50–88 × 26–34 μ, bitunicati. Ascosporae 26–36 × 10–12 μ, hyalinae vel alutaceae, obovato-clavatae, 5–6-septatae, ad septum primum constrictae.

Specimen typicum insidens foliis *Pini strobi,* prope "Roaring Brook Road,

Conway, Massachusetts, 11 Nov 1963" a *M. E. Barr* n. *4153* lectum, in herbario Univ. Mass. depositum.

Ascocarps 100–200 μ diam at base, 100–150 μ high, conic, tapered from base to oblique apex; basal wall thin, light brown; side wall dark brown. Asci 50–88 × 26–34 μ. Ascospores 26–36 × 10–12 μ, hyaline, dull brown in age, obovate-clavate, rounded toward apex, narrowed and slightly tapered to base, 5–6-septate, the primary septum supramedian, slightly constricted; secondary and tertiary septa below the primary; gelatinous coating not present.

On fallen leaves of *Pinus strobus* L., eastern North America, *Pinus* spp., Europe.

Material examined:

Massachusetts: *Barr 4153* (type), *4154* (MASS).

This species differs in ascospore shape from the two previous species, but all are similar in ascocarps and asci. Gremmen (1960) illustrated and described the fungus as *Lophiostoma pinastri* Niessl, but that species according to descriptions is truly a *Lophiostoma.*

Monascostroma v.Höhnel, Ann. Mycol. 16: 160. 1918.

Ascocarps thickly scattered to grouped, small, immersed or erumpent, depressed globose or globose-conic; wall of several layers of dark brown cells forming *textura angularis,* glabrous, with small apical pore at maturity. Asci few, saccate or oblong, bitunicate; interthecial tissue sparse. Ascospores crowded in the ascus, hyaline, yellowish or becoming brown, elliptic, fusoid, or obovate, 1-septate, slightly constricted; 1 or 2 additional septa formed in age; contents with two large globules per cell; wall smooth or finely roughened, surrounded by a thin gelatinous coating.

Conidial state not known.

Saprobic on dead overwintered leaves, culms of monocotyledons, twigs of woody dicotyledons, leaves of conifers; temperate North America, Europe.

Monascostroma is distinguished by small ascocarps, relatively thin-walled, and the one-septate hyaline or light brown ascospores. The genus was described as having a single ascus in the locule, and this may be true in the smallest ascocarps, but usually each locule contains several (up to eight to ten) asci, separated by sparse interthecial tissue.

Type species: *M. innumerosa* (Desm.) v.Höhnel.

Monascostroma innumerosa (Desm.) v.Höhnel, Ann. Mycol. 16: 160. 1918.

≡ *Hendersonia innumerosa* Desm. Ann. Sci. Nat. Bot. ser. 3, 16:305. 1851.
≡ *Stagonospora innumerosa* (Desm.) Sacc. Syll. Fungorum 3: 451. 1884.
≡ *Phaeosphaerella innumerosa* (Desm.) Müller, Rev. Mycol. (Paris) 19: 59. 1954.
= *Mycosphaerella pheidasca* Schroet. in Cohn, Kryptogamenfl. Schlesiens 3(2):342. 1894.
≡ *Phaeosphaerella pheidasca* (Schroet.) Sacc. Syll. Fungorum 11: 312. 1895.

Ascocarps 66–120 μ diam, globose, depressed or conic. Asci 33–46.5 × 15–21 μ, one or two or up to 8 in a locule. Ascospores 15.5–24 × (4–)6–8 μ, hyaline then yellowish to brown, obovate or fusoid with pointed base, inequilateral to slightly curved; wall finely roughened in age, surrounded by gelatinous coating ca. 1 μ thick.

On *Juncus* spp., Europe, North America.

Material examined:

Europe: *Rehm, Ascomycetes 1990.* Nova Scotia: *Wehmeyer 1706* (MICH). Nebraska: Scotia, 19 Sept 1906, *J. M. Bates* (NYS, in packet of *Graphyllium chloes* var. *junci*).

The yellowish brown ascospores may develop one or two additional septa in age.

Additional species:

Monascostroma euryasca (Ellis & Galloway) Barr, comb. nov.

≡ *Didymosphaeria euryasca* Ellis & Galloway, J. Mycol. 5: 67. 1889.

Ascocarps 80–100 μ diam, globose-conic. Asci 33–47 × 12–14.5 μ. Ascospores 12–14.5 × 4–5.5 μ, brown, elliptic-obovate, the ends tapered but obtuse; gelatinous coating 1–1.5 μ thick.

On leaves of *Pinus contorta* Dougl. var. *latifolia* Engelm., western North America.

Material examined:

Montana: summit of Mt. Helena, Lewis and Clarke Co., 14 Sept 1887, *Anderson* (holotype, NY).

The small, relatively thick walled ascocarps and the presence of interthecial tissue in the locule force the removal of this fungus from *Didymosphaeria.* The ascospores are a rich brown in the type collection, the only one seen.

Monascostroma pruni Barr, sp. nov. Figures 9–11.

Ascocarpia (70–)80–110 μ diametro, globosa vel late conica. Asci 33–53 × 9–13.5 μ, pauci, bitunicati. Ascosporae 12–18.5 × 4–5 μ, hyalinae, elliptico-obovatae, uniseptatae.

Specimen typicum in ramis emortuis *Pruni pensylvanicae,* prope "Stony Brook Trail, near Gorham, New Hampshire, 26 July 1963," a *M. E. Barr* n. *3996* lectum; in Herbario Univ. Mass. depositum.

Ascocarps (70–)80–110 μ diam, globose-conic. Asci 33–53 × 9–13.5 μ. Ascospores 12–18.5 × 4–5 μ, hyaline, elliptic-obovate, tapered to obtuse ends, straight to inequilateral; gelatinous coating 1 μ thick.

On dead branches of *Prunus pensylvanica* L., eastern North America.

Material examined:

New Hampshire: *Barr 3996* (type, MASS).

The thickly grouped ascocarps form roughened areas or bands extending entirely around small twigs.

Leptosphaerulina McAlpine, Fungous diseases of stone-fruit-trees in Australia 103. 1902.

= *Scleropleella* v.Höhnel, Ann. Mycol. 16: 158. 1918.
  ≡ *Leptosphaeria* subgenus *Scleropleella* (v.Höhnel) Müller, Sydowia 4: 214. 1950.
= *Pseudoplea* v.Höhnel, Ann. Mycol. 16: 162. 1918.
= *Pleospora* section *Pseudopleella* Müller, Sydowia 5: 265. 1951.

Ascocarps small, globose or conic, immersed becoming erumpent; wall thin, with one to three layers of brown cells, *textura angularis,* the surface glabrous; apical pore opening widely at maturity. Asci few, saccate or oblong, bitunicate, in interthecial tissue which is often entirely obliterated at maturity. Ascospores overlapping biseriate or crowded in the ascus, hyaline or yellowish or brown, obovate to elliptic or clavate, several-septate, usually with vertical septum in one or more of mid cells; wall smooth or roughened at maturity, at times surrounded by a thin gelatinous coating.

Conidial state not known.

Parasitic or saprobic on leaves, culms, stalks, or small branches of monocotyledons and dicotyledons; widespread and apparently cosmopolitan in subarctic and temperate regions.

Scleropleella was erected to accommodate *S. personata* (Niessl) v.Höhnel. This species differs only in ascospore septation from *Leptosphaerulina australis.* Müller (1950) regarded *Scleropleella* as a subgenus of *Leptosphaeria,* but designated *L. salebricola* as type of the subgenus. His account of the species included *S. personata.* The majority of species which he placed in the subgenus are pleosporaceous and belong in *Phaeosphaeria* (Holm, 1957).

Von Höhnel's *Pseudoplea,* with the type species *P. briosiana,* is a parasitic fungus which develops in living tissues. Its morphology is similar to that of *Leptosphaerulina*

australis. Graham and Luttrell (1961) relegated *Pseudoplea* to the synonymy of *Leptosphaerulina.*

Mycotodea Kirschst. (Ann. Mycol. 34: 201. 1936) was erected on a theoretical basis, since Kirschstein had seen none of the species which he transferred to the genus. *M. heufleuri* (Niessl) Kirschst. was designated the type species, and *M. pulchra* (Winter) Kirschst. and *M. hyperborea* (Fuckel) Kirschst. were also included in the genus. *M. heufleuri* may be a species of *Phaeosphaeria* according to information in the literature, but the other two entities belong in *Leptosphaerulina.* Petrak (1940) considered *Mycotodea* a synonym of *Leptosphaeria,* or of *Scleropleella* if that genus were to be maintained. Müller (1951b) regarded *Mycotodea* as synonymous with *Leptosphaeria* subgenus *Scleropleella.*

Key to Sections

1. Ascospores transversely septate, vertical septa lacking; saprobic species. Section *Scleropleella.*
1. Ascospores both transversely and vertically septate.
   2. Saprobic species. Section *Leptosphaerulina.*
   2. Parasitic species, often forming spots in living leaves. Section *Pseudoplea.*

Leptosphaerulina section **Leptosphaerulina**

Saprobic in overwintered leaves of stalks; ascospores with vertical septum in one or more of mid cells.

Type species: *L. australis* McAlpine.

Leptosphaerulina australis McAlpine, Fungous diseases 103. 1902. For synonymy, see Graham and Luttrell (1961).

Ascocarps 40–170 μ diam. Asci 50–90 × 30–45 μ. Ascospores 25–40 × 10–15 μ, hyaline or light brown, obovate, (3–)4 (–6)-septate, with vertical septum in one or more of mid cells.

On *Rosa* spp., *Prunus* spp., culms of Gramineae, North America, Europe, Australia, Asia.

Graham and Luttrell (1961) provided a detailed description and illustrations of this species. The development of the ascocarp has been described and illustrated by Müller (1951a, 1966) and Wehmeyer (1955).

Two other species in this section of the genus, *L. americana* (Ell. & Ev.) Graham & Luttrell and *L. argentinensis* (Speg.) Graham & Luttrell were also described in Graham and Luttrell's paper.

Additional species:

Leptosphaerulina pulchra (Wint.) Barr, Contr. Inst. Bot. Univ. Montréal 73: 7. 1959. Figures 12–14.

This minute subarctic-subalpine species occurs on a number of host plants especially Rosaceae and Compositae, in North America and Europe. For description and synonymy see Barr (1959).

Leptosphaerulina section **Pseudoplea** (v.Höhnel) Barr, comb. nov.

≡ *Pseudoplea* v.Höhnel, Ann. Mycol. 16: 162. 1918.

Parasitic, often forming spots in living leaves; ascospores with vertical septum in one or more cells.

Type species: *L. briosiana* (Poll.) Graham & Luttrell, Phytopathology, 51: 685. 1961.

L. briosiana develops in leaves of *Medicago* and *Trifolium* and has been found in Europe, North America, and South America. Graham and Luttrell (1961) described the species and gave synonymy.

Other species in the section described by Graham and Luttrell are *L. trifolii* (Rostrup) Petrak and *L. arachnidicola* Yen, Chen & Huang. *L. myrtillina* (Sacc. & Fautr.) Petrak (1959b) is a European species which forms spots in leaves of *Vaccinium myrtillus.* The ascospores are similar to those in species of *Pyrenophora,* but the ascocarps are small and thin walled as in *Leptosphaerulina.*

Leptosphaerulina section **Scleropleella** (v.Höhnel) Barr, comb. nov.

≡ *Scleropleella* v.Höhnel, Ann. Mycol. 16: 158. 1918.

Saprobic in overwintered leaves, stalks, or culms; ascospores transversely septate, without vertical septum.

Type species: *L. personata* (Niessl) Barr.

Leptosphaerulina personata (Niessl) Barr, comb. nov.

≡ *Leptosphaeria personata* Niessl in Rabenh. Fungi europaei n. 1933; Bot. Jahresber. (Just) 2: 262: 1875.
≡ *Scleropleella personata* (Niessl) v.Höhnel, Ann. Mycol. 16: 158. 1918.
≡ *Mycotodea personata* (Niessl) Kirschst. Kryptogamenfl. Mark Brandenburg 7(3): 433. 1938.

Ascocarps 50–156 μ diam, 78–104 μ high, globose or depressed, immersed; wall 6–10 μ thick, of two layers of slightly compressed brown cells; yellowish brown hyphae forming a thin weft over the wall and into leaf tissues. Asci 33–60 × (10.5–)13–25 μ, saccate. Ascospores 15–22.5 × 4.5–7 μ, hyaline, soon brown, obovate, straight to inequilateral, (1-, 2-)3-septate, constricted at the primary septum which is supramedian, with upper portion broader than lower; wall finely roughened at maturity, surrounded by a thin gelatinous coating.

On culms of *Deschampsia caespitosa* (L.) Beauv., Europe, North America.

Material examined:

Europe: *Rabenhorst, Fungi eur. 1933* (isotype, NY). Quebec: *Barr 1962* (DAOM, MASS, as *Leptosphaeria eustoma*).

Leptosphaerulina personata resembles *Monascostroma innumerosa,* but differs especially in having somewhat larger ascocarps containing relatively numerous asci in interthecial tissue; *M. innumerosa* has few asci in the locule. The ascospores are quite similar in size and shape in the two species. Those of *M. innumerosa* are one-septate with one or two additional septa in age at times, whereas those of *L. personata* are three-septate early in development.

Additional species:

Leptosphaerulina hyperborea (Fuckel) Barr, comb. nov. Figure 15.

≡ *Pleospora hyperborea* Fuckel in Bonorden & Fuckel, Pilze *in* Zweite Deutsche Nordpolfahrt. Geog. Ges. Gremen 2: 92. 1874.
≡ *Leptosphaeria hyperborea* (Fuckel) Berl. & Vogl. Addit. Syll. Fungorum 140. 1886.
≡ *Mycotodea hyperborea* (Fuckel) Kirschst. Ann. Mycol. 34: 201. 1936.
= *Leptosphaeria brachyasca* Rostr. Meddel. Grønland 3: 618. 1891.

This species has ascospores similarily shaped to those of *L. personata* but the sizes are larger in well-developed specimens. The ascocarps in *L. hyperborea* are often conic and erumpent rather than depressed globose and immersed as in *L. personata.* The species was described from a number of woody dictoyledonous hosts from subarctic North America (Barr 1959).

Wettsteinina v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. I, 116: 126. 1907.

= *Pseudosphaeria* v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. I, 116: 129. 1907.

Ascocarps usually uniloculate, middle-sized to large, globose, conic, or depressed, immersed becoming erumpent, occasionally few grouped and connected by hyphae; wall relatively thick, with several layers of cells forming *textura angularis,* the surface glabrous or with hyphal or setose appendages; ascocarps opening by small often irregular pore or at times the entire apex cap-like and dehiscing to leave a broad opening. Asci few, saccate, oblong, or clavate, bitunicate, in interthecial tissues. Ascospores crowded in the ascus, hyaline or yellowish brown or dark brown, narrowly or broadly elliptic, or obovate, one- to several-septate, deeply constricted at primary septum; secondary septum formation frequently delayed and evident only as ring-like constrictions in cells; vertical septum in one or few mid cells when present; wall smooth or roughened, usually surrounded by a gelatinous coating; contents with large rounded or rarely lenticular globules.

Conidial state not known.

Mostly saprobic on a wide range of monocotyledons and dicotyledons on overwintered leaves and stalks, rarely on woody substrata; widespread and apparently cosmopolitan in subarctic regions, less frequent in temperate regions.

Von Höhnel (1907a,b) based the family Pseudosphaeriaceae on *Wettsteinina* and *Pseudosphaeria.* The only difference between the two genera was in the formation of vertical septa in the ascospores of *Pseudosphaeria.* Petrak (1947) concluded that *Pseudosphaeria* was synonymous with *Wettsteinina,* and that *Wettsteinina* could be distinguished from *Pseudoplea* (i.e. *Leptosphaerulina*) by larger thick walled ascocarps.

Key to Subgenera and Sections

1. Ascocarps on strand-like branched stromatic tissue; ascospores septate early with both transverse and vertical septa. Subgenus *Wettsteiniella.*
1. Ascocarps not formed on stromatic tissue of strand-like structure; ascospores often tardily septate; vertical septa infrequently formed. Subgenus *Wettsteinina.*
   2. Primary septum of ascospores nearly median, secondary septum or ring-like constriction formed in each cell, vertical septum rarely in mid cells. Section. *Massarioidea.*
   2. Primary septum of ascospore supramedian.
      3. One or more secondary septa or ring-like constrictions formed in equal numbers in upper and lower portions of ascospore. Section *Wettsteinina.*
      3. Secondary septa or ring-like constrictions more numerous in lower than upper portion of ascospore. Section *Pseudosphaeria.*

No representatives of *Wettsteinina* subgenus *Wettsteiniella* Petrak, Sydowia 9: 578. 1955, are known as yet from North America. *W. carinthiaca* Petrak, the type of the subgenus, is distinguished by forming a branched stroma of parallel hyphae in or on the edges of which ascocarps develop, and by ascospores which are septate both transversely and vertically early in development.

Wettsteinina subgenus **Wettsteinina.**

Ascocarps immersed to erumpent, often with brown hyphae or at times with stromatic connecting tissue; ascospores variable in septation.

Wettsteinina subgenus **Wettsteinina** section **Wettsteinina.**

Ascospores with supramedian primary septum; one or more secondary septa or ring-like constrictions formed in each portion.

Type species: *W. gigaspora* v.Höhnel.

Wettsteinina gigaspora v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. 1, 116: 126. 1907. Figure 19.

= *Pleospora hoehneliana* Petrak, Ann. Mycol. 25: 207. 1927.

Ascocarps (245–)400–700 μ diam, 165–300 μ high, depressed globose; wall 60–70 μ thick, bearing scattered brown hyphae in plant tissues. Asci 100–252 × (36–)80–140 μ, broadly oblong to saccate. Ascospores (37.5–)72–120 × (9–)16–44 μ, hyaline, elliptic fusoid when young, becoming obovate (the ends obtuse) straight or inequilateral, deeply constricted at supramedian primary septum, with two secondary ring-like constrictions formed in each cell; gelatinous coating 6–9 μ thick.

On overwintered monocotyledons or herbaceous dicotyledons, Europe, North America.

Material examined:

Quebec: *Barr 1929B,* on *Coptis groenlandica* (Oeder) Fern. (DAOM, MASS). British Columbia: *Barr 606,* on *Aquilegia formosa* Fisch. (MASS).

The ascospores remain one-septate for a long time, with only the ring-like constrictions to indicate the eventual position of secondary septa.

Additional species:

Wettsteinina niesslii Müller, Sydowia 4: 204. 1950.

= *Leptosphaeria gigaspora* Niessl in Rabenh. Fungi europaei n. 2998. 1882.

Ascocarps 165–400 μ diam, globose to depressed; wall 16–35 μ thick. Asci 80–160 × 21–38 μ, broadly oblong. Ascospores 52–67 × (4.5–)6–14 μ, hyaline or yellowish, elongate elliptic-fusoid (the ends pointed), 1–3-septate, finally 6–7(–8)-septate, constricted at primary septum; wall smooth, the gelatinous coating 3–4.5 μ thick.

On monocotyledon stalks, Europe, North America.

Material examined:

Northwest Territories: *Bartlett 3275,* on *Carex* sp. (MICH). Quebec: *Barr 1956,* on *Eriophorum angustifolium* Honckeny (MASS).

The ascospores in the collection on *Carex* are more fully matured and have more secondary septa than had been observed previously. The description of *Mycosphaerella bacillifera* (Karst.) Müller & Poelt, Mitt. Bot. München 5: 136. 1963, is reminiscent of this species, but I have not examined any specimens referable to *M. bacillifera.*

Other species of *Wettsteinina* which are unknown from North America as yet appear to belong in this section: *W. ambigua* Petrak, Ann. Mycol. 22: 59. 1924, and *W. winteri* (Niessl) Müller, Sydowia 4: 203. 1950.

Wettsteinina subgenus **Wettsteinina** section **Pseudosphaeria** (v.Höhnel) Barr, comb. nov.

≡ *Pseudosphaeria* v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt.I, 116: 129. 1907.

Ascospores with supramedian primary septum, secondary septa or ring-like constructions more numerous in lower than upper portion.

Type species: *W. pachyasca* (Niessl) Petrak.

Wettsteinina pachyasca (Niessl) Petrak, Sydowia 1: 56. 1947.

≡ *Leptosphaeria pachyascus* Niessl, Oesterr. Bot. Z. 31: 345. 1881.
≡ *Metasphaeria pachyasca* (Niessl) Sacc. Syll. Fungorum 2: 171. 1883.
≡ *Pseudosphaeria pachyasca* (Niessl) v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. I, 116: 129. 1907.
≡ *Saccothecium pachyasca* (Niessl) Kirschst. Ann. Mycol. 37: 105. 1939.
= *Sphaerulina callista* Rehm, Hedwigia 21: 122. 1882.
≡ *Pseudosphaeria callista* (Rehm) v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. I, 116: 129. 1907.
≡ *Saccothecium callistum* (Rehm) Kirschst. Ann. Mycol. 37: 105. 1939.
≡ *Wettsteinina callista* (Rehm) Petrak, Sydowia 1: 55. 1947.

Ascocarps 100–200(–280) μ diam, globose, depressed, or conic; wall relatively thin. Asci 140–170 × 40–70 μ, oblong or saccate. Ascospores (35–)45–84 ×12–18 μ, hyaline, obovate, 6-septate, with two septa above and three below primary septum, the cell above the primary septum enlarged.

On herbaceous stalks, Europe, Asia.

This species is not known as yet from North America, and synonymy and description are taken from recent European literature. The number of septa in the ascospores separates *W. pachyasca* from the following species of the section.

Additional species:

Wettsteinina mirabilis (Niessl) v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. I, 116: 635. 1907. Figures 16–18.

≡ *Leptosphaeria mirabilis* Niessl. Hedwigia 20: 97. 1881.
≡ *Pleospora mirabilis* (Niessl) Petrak, Ann. Mycol. 25: 207. 1927.
= *Massarina gigantospora* Rehm in Voss, Verh. Zool.-Bot. Ges. Wien 37: 216. 1887.
≡ *Wettsteinina gigantospora* (Rehm) v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. I, 116: 129. 1907.
= *Sphaerulina callista* var. *vossii* Rehm in Voss, Verh. Zool.-Bot. Ges. Wien 37: 220. 1887.
≡ *Wettsteinina vossii* (Rehm) v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. I, 116: 129. 1907.

Ascocarps 120–210 μ diam, globose; wall relatively thin. Asci 75–150 × 45–66 μ, saccate or broadly oblong. Ascospores (46.5–)54–83 × (10.5–)12–27(–33) μ, hyaline, finally dull dark brown, broadly obovate-elliptic, constricted at primary supramedian septum, with one secondary constriction or septum above and two below the primary; wall finely or coarsely roughened at maturity, the gelatinous coating 2.5–6 μ thick.

On herbaceous dicotyledon stalks and leaves, Europe, North America.

Material examined:

Newfoundland: Fort McKenzie, 8 June 1955, *Wilce,* on *Viola* sp.; *Rouleau 430a,* on *Dryas integrifolia* Vahl. Quebec: *Barr 2266,* on *Artemisia canadensis* Michx. (all in DAOM, MASS).

Müller and von Arx (1962) relegated *Eriosphaeria herbarum* Wehm. and *E. macrospora* Wehm. to the synonymy of *W. mirabilis.* However, ascospore septation of the Wehmeyer specimens differs from that of *W. mirabilis* and I believe that they belong in the next section of the genus.

Wettsteinina engadinensis Müller, Sydowia 4: 202. 1950.

Ascocarps 220–300 μ diam, globose with apex somewhat elongated; wall 16–20 μ thick. Asci 130–150 × 24–32 μ, broadly oblong. Ascospores 42–57 × 8–10.5 μ, yellowish, elongate elliptic, straight to inequilateral, slightly constricted at supramedian primary septum, with one secondary septum above the three below the primary septum, the cell above the primary septum slightly broader than the others; wall smooth, the gelatinous coating thin, ca. 2 μ thick.

On dicotyledon herbaceous stalks, Europe, North America.

Material examined:

Newfoundland: near Cooke Harbor, 14 August 1957, *Wilce,* on *Epilobium latifolium* L. (MASS).

Narrower, paler ascospores distinguish this species from *W. mirabilis.* Holm (1961) considered that *W. engadinensis* was closely related to and probably conspecific with *Nodulosphaeria kümmerlei* Moesz. The major differences between the European and North American collections of *W. engadinensis* seem to lie in larger sizes of ascocarps and asci of the Newfoundland material. The ascospores of all three entities are quite similar, five-septate with the second cell enlarged. In *N. kümmerlei* on *Campanula* leaves they measure 35–45 × 7.5–10.5 μ and have terminal almost globose gelatinous appendages, 7–9 μ in diameter (Holm 1961). In *W. engadinensis* on *Aster* stalks they

measure 39–52 × 12–13 μ and are surrounded by a gelatinous coating which is enlarged to caplike ends (Müller 1950). In the Newfoundland collection they measure 42–57 × 8–10.5 μ and the gelatinous coating is equally 2 μ thick.

Wettsteinina eliassonii Petrak, Sydowia 9: 491. 1955, was described as parasitic in leaves of *Saussurea* and *Crepis* in Europe. The species appears to belong in section *Pseudosphaeria.*

Wettsteinina subgenus **Wettsteinina** section **Massarioidea** Barr, sect. nov.

Ascosporae ellipticae obovate, septum primum medium, septa secondaria una per cellulum.

Species typicum: *W. dryadis* (Rostr.) Petrak.

Ascospores elliptic-obovate; primary septum median or nearly so; one secondary septum or ring-like constriction in each half, occasionally a vertical septum in one or both mid cells.

Several groups of species are recognized in this section and are designated as series:

1. Series of *W. dryadis:* Ascocarps globose to conic, the apex papillate; ascospores elliptic-obovate, the cells nearly equal in length.

Wettsteinina dryadis (Rostr.) Petrak, Sydowia 1: 322. 1947.

This species is found on leaves of *Dryas* spp. in Europe, Asia, and North America. For synonymy and description see Barr (1959). An additional collection is: British Columbia: Field, 11 Sept 1925, *collector unknown* (UBC).

Wettsteinina andromedae (Auersw.) Barr, Contr. Inst. Bot. Univ. Montréal. 73: 8. 1959, var. **andromedae**.

Synonymy and a description are provided by Barr (1959).

Wettsteinina andromedae (Auersw.) Barr, var. **cassiopes** (Dearn. & House) Barr, Canad. J. Bot. 45: 1041. 1967.

This variety was described and discussed recently (Barr 1967).

Wettsteinina eucarpa (Karst.) Müller & von Arx, Ber. Schweiz. Bot. Ges. 60: 335. 1950.

W. eucarpa was described by Müller and von Arx (1950, 1962) and by Barr (1959).

Wettsteinina sieversiae (Peck) Barr, Canad. J. Bot. 45: 1042. 1967.

Synonymy, description, and discussion of the species are provided by Barr (1967).

Wettsteinina ellisii Barr, sp. nov. Figure 20.

Ascocarpia 180–200 μ diametro, 170–200 μ alta, globosa vel depressa, immersa vel erumpentia, peridio 30–40 μ crasso. Asci 70–88 × 22–25 μ, oblongi vel saccati, pauci, bitunicati. Ascosporae 23–28.5 μ longae, supra 9–10 μ latae, infra 7.5–8 μ latae, brunneae, obovatae, 3-septatae, strato gelatinoso 2–3 μ crasso obductae.

Specimen typicum in foliis emortuis *Pini contortae* var. *latifoliae,* prope "summit of Mt. Helena, Lewis and Clarke Co., Montana, 14 Sept 1887," legit *F. W. Anderson* n. *403*; in Herb. New York Botanical Garden depositum.

Ascocarps 180–200 μ diam, 170–200 μ high, globose or very slightly depressed, immersed becoming erumpent, seriate in small groups of 2–3 or more; walls grown together at times, the apex plane; wall 30–40 μ thick, of 4–6 layers of dark brown, polygonal cells. Asci 70–88 × 22–25 μ, oblong saccate, few. Ascospores 23–28.5 μ long, 9–10 μ wide above, 7.5–8 μ wide below, yellowish brown or dull brown,

obovate, straight to inequilateral, 3-septate, constricted at the primary septum; wall smooth, the gelatinous coating 2–3 μ thick; each cell with a large globule.

On dead leaves of *Pinus contorta* Dougl. var. *latifolia* Engelm., western North America.

Material examined:

Montana: *F. W. Anderson, Parasitic Fungi of Montana 403* (type, NY, as *Didymosphaeria euryasca*).

This species is described from material which also bears the type specimen of *Didymosphaeria euryasca* Ellis & Galloway (see *Monascostroma euryasca*). From my observations on the material, this species is more conspicuous than the one which was originally described. However, there is no mention of the *Wettsteinina* in the type description of *D. euryasca,* nor are the two fungi confused in the description.

2. Series of *W. operculata*: Ascocarps depressed-globose, the apex rounded or plane, occasionally papillate; ascospores elliptic-obovate, occasionally fusoid, the cells nearly equal in length.

Wettsteinina operculata Barr, sp. nov.

Ascocarpia 120–280 μ diametro, 100–230 μ alta, globoso-depressa, immersa vel erumpentia; apex plano-papillatus, dehiscens et latam aperturam formans, peridio 13–24 μ crasso. Asci 77–140 × 22–42 μ, oblongi, bitunicati. Ascosporae 24–50 × (5.5–)10–16.5 μ, hyalinae tarde brunneae, ellipticae, 1-septatae vel tarde 3-septatae, strato gelatinoso 2–7.5 μ crasso obductae.

Specimen typicum in foliis emortuis *Triglochinis maritimae,* prope "Seal Cove Pond, Newfoundland, 11 July 1957" legit *R. T. Wilce*; in Herb. Univ. Mass. depositum.

Ascocarps 120–280 μ diam, 100–230 μ high, depressed globose, immersed to erumpent, the apex broadly papillate and ± plane, dehiscent at times as a lid-like "operculum" and then opened widely; wall relatively thin, 13–24 μ thick, of dark to light brown polygonal cells, bearing brown hyphae in leaf tissue. Asci 77–140 × 22–42 μ, broadly oblong. Ascospores 24–50 × (5.5–)10–16.5 μ, hyaline, finally brown after discharge, elliptic, straight to slightly curved; primary septum nearly median, one ring-like constriction formed in each cell and the spores finally 3-septate; wall smooth to finely roughened, the gelatinous coating 2–7.5 μ thick.

On overwintered leaves and culms of monocotyledons, North America.

Material examined:

Northwest Territories: *Savile 3759A* on *Arctagrostis latifolia* (R.Br.) Griseb., *4191G* on *Puccinellia angustata* (R.Br.) Rand & Redf. (DAOM). Newfoundland: Seal Cove Pond, 11 July 1957, *Wilce,* on *Triglochin maritima* L. (type, MASS).

This species was at first confused with *W. macrotheca,* but the ascospores of the two differ in shape and in insertion of secondary septa. Those of *W. macrotheca* are oblong, straight, with the mid cells shorter than the end cells, while the ascospores of *W. operculata* are elliptic, curved, and have the secondary septa nearly median in each cell. The specific epithet of this new species refers to the cap-like structure at the apex of the ascocarps. At maturity the entire cap may fall, leaving a broad pore. A similar cap-like apex was reported on ascocarps of *Clathrospora heterospora* var. *simmonsii* (Corlett 1967).

Wettsteinina yuccaegena Barr, sp. nov.

Ascocarpia 275–550 μ diametro, 275–330 μ alta, globoso-depressa vel elongata, immersa, peridio 32–39 μ crasso. Asci 65–80 × 23–30 μ, clavati, bitunicati. Ascosporae 32–38 × 9–11 μ, hyalinae vel fulvae vel brunneae, ellipticae, uniseptatae.

Specimen typicum in foliis emortuis *Yuccae glaucae,* prope "Manhattan, Kansas,

Sept 1884" a *W. A. Kellerman* lectum, sub nomine *Coniothyrium herbarum Ell. & Ev. N.A.F. 1366*; in herb. Univ. Mass. depositum.

Ascocarps 275–550 μ diam, 275–330 μ high, depressed globose or at times elongate, immersed beneath the cuticle, scattered to grouped; wall 32–39 μ thick, bright brown, composed of large cells with vinaceous tinge, blackened at upper sides and in hyphae packing epidermal cells, thinner and light colored over the plane apex. Asci in a single locule or several small locules, 65–80 × 23–30 μ, short clavate. Ascospores 32–38 × 9–11 μ, hyaline or yellowish or light dull brown, elliptic, 1-septate, slightly constricted at the septum; no gelatinous coating seen.

On dead leaves of *Yucca glauca* Nutt., North America.

Material examined:

Kansas: *Ell. & Ev. N.A.F. 1366* as *Coniothyrium herbarum* Ell. & Ev. (holotype in MASS).

This fungus seems best considered as a species of *Wettsteinina,* even though no ascospores were found with more than one septum. The material appears to be somewhat immature, and older specimens may have ascospores with additional septa. The aspect of the ascocarps, both under a dissecting microscope and under 100X magnification in section, is similar to that of *Kellermannia anomala* (Cooke) v.Höhnel. The latter fungus produces within a locule elongate, one-septate conidia bearing a slender apical appendage.

Wettsteinina sabalicola (Earle) Barr, comb. nov.

≡ *Gnomonia sabalicola* Earle, Bull. Torrey Bot. Club 25: 361. 1898.

Ascocarps in groups up to 3–5 mm wide, visible as grayish blotches, subepidermal, 170–250 μ diam, 100–150 μ high, depressed globose, produced in and connected by stromatic tissue of upright rows of brown cells forming *textura prismatica*; lower portion less compact, penetrating to 500 μ deep in leaf parenchyma, surrounding but not entering scattered vascular bundles; apical pores stuffed with small cells, or tips of interthecial tissues. Asci 50–65 × 20–28 μ, broadly oblong to saccate. Ascospores 23–30 × 6.5–14.5 μ, hyaline, elliptic, straight to inequilateral, 1 (–3)-septate, constricted at the primary septum; gelatinous coating 2–3 μ thick.

On leaves of *Sabal adansoni* Guerns., North America.

Material examined:

Alabama: Auburn, Lee Co., 25 Apr 1896, *F. S. Earle* (type, NY); same locality, 9 July 1896, *Earle & Underwood* (NY).

This fungus bears some resemblance to *Hysterostomella* or *Palawania* in the Pleosporales. However, species of these genera are superficial on the host and their wall cells are arranged in radiating rows. The locules in *W. sabalicola* have the aspect of *Wettsteinina* as do asci and ascospores. The massive stromatic tissue which connects and surrounds ascocarps distinguishes this species from others of *Wettsteinina.*

The character which led Earle to describe *W. sabalicola* as a species of *Gnomonia* was the presence of elongate "beaks" on the surface of the leaf blotches. These structures are slender superficial outgrowths up to 1 mm long. They have no canal and are not connected with the locules in any fashion other than chance occurrence on some blotches.

Wettsteinina anomala (Ell. & Ev.) Barr, comb. nov. Figure 21.

≡ *Leptosphaeria anomala* Ell. & Ev. J. Mycol. 3: 117. 1887.
≡ *Didymosphaeria anomala* (Ell. & Ev.) Sacc. Syll. Fungorum 9: 730. 1891.
≡ *Microthelia anomala* (Ell. & Ev.) Kuntze, Rev. Gen. Pl. 3(2): 498. 1898.
= *Eriosphaeria herbarum* Wehm. Sydowia 6: 419. 1952.
= *Eriosphaeria macrospora* Wehm. Sydowia 6: 420. 1952.
≡ *Wettsteinina macrospora* (Wehm.) Petrak, Sydowia 11: 341. 1958 ["1957"].

Ascocarps 250–380 μ diam, globose, conic, or depressed, erumpent, scattered thickly on stalks; wall thick, of coarse brown or reddish-brown polygonal cells and inner hyaline compressed layers, with numerous brown hyphal appendages arising from upper wall; trailing or erect hyphae from the lower portion of the wall forming a tomentose base; ascocarp apex short papillate, the pore small. Asci 90–225 × (15–)22–53 μ, broadly oblong or clavate, occasionally 16-spored. Ascospores (23–)30–54 × (7.5–)9–14.5 μ, hyaline or yellowish, at times light dull brown, elliptic to obovate, straight to inequilateral or curved; primary septum nearly median, a ring-like constriction formed in each cell and the spores finally 3-septate, constricted at all septa; wall smooth, the gelatinous coating 2.5–5.5 μ thick.

On overwintered dicotyledonous herbaceous stalks, western North America.

Material examined:

British Columbia: *Barr 414* on *Pedicularis* sp. (UBC). Utah; Utah Territory, June 1887, *S. J. Harkness* on herbaceous stems (holotype of *Leptosphaeria anomala,* NY). Washington: *Simmons 1746* on composite stems (holotype of *E. macrospora,* MICH); *Simmons 2353* on stems (holotype of *E. herbarum,* MICH).

The specimen of *E. macrospora* has the largest ascospores of the collections grouped as *W. anomala.* These ascospores tend to be straight rather than curved, but immature ones are inequilateral and have the size range of the other collections. Petrak (1958a) considered *E. herbarum* (as "*E. herbacea*") as a form of *W. macrospora* with 16-spored asci. The type collection of *L. anomala* provided only one-septate, even rarely one-celled ascospores, identical with immature ascospores of the other collections. The heavy tomentum surrounding ascocarps is characteristic of all collections. Müller and von Arx (1950) illustrated this species as *Didymosphaeria* and observed that it was related to *Wettsteinina.*

3. Series of *W. macrotheca*: Ascocarps globose to conic, the apex short and broad papillate; ascospores oblong, the mid cells shorter than the end cells.

Wettsteinina macrotheca (Rostr.) Müller, Sydowia 12: 203. 1959 ["1958"]. Figure 22.

≡ *Metasphaeria macrotheca* Rostr. Meddel. Grønland 3: 561. 1888.
≡ *Massaria macrotheca* (Rostr.) Lind, Skrifter om Svalbard og Ishavet 13: 31. 1928.
≡ *Leptosphaeria macrotheca* (Rostr.) Holm, Svensk Bot. Tidskr. 46: 38. 1952.

Ascocarps 130–310 μ diam, globose, depressed, or conic; wall light brown, often tomentose with hyphae. Asci 90–158 × 25–36 μ, broadly clavate or saccate. Ascospores (24–)32–37(–48) × 7.5–13.5(–15) μ, hyaline, dull brownish in age, oblong or nearly so, 1–3-septate, the mid cells shorter than the end cells.

On culms and leaves of Cyperaceae, North America, Europe, Asia.

Material examined:

Northwest Territories: *Savile 3738A* (DAOM). Newfoundland: south of McClellan Strait, 17 July 1955, *Wilce* (DAOM, MASS). Quebec: *Barr 1956* (DAOM, MASS). British Columbia: *Barr 138* (UBC).

The species appears to be circumpolar on members of the Cyperaceae, particularly *Carex* spp. Müller (1959a) recorded it from the Swiss Alps, and I found it in the southern coastal mountains of British Columbia (Barr 1953).

Wettsteinina gentianae (Wehm.) Barr, comb. nov.

≡ *Sphaerulina gentianae* Wehm. Mycologia 38: 166. 1946.

Ascocarps 400–500 μ diam, globose to conic, immersed, soon erumpent, scattered, the apex short papillate; wall thick, blackish brown. Asci 150–270 × 32–54 μ, broadly oblong, few to numerous. Ascospores 45–54 × 14–18 μ, hyaline becoming dull grayish brown at maturity, elliptic-oblong, 3-septate, constricted at the septa, the mid cells shorter than the end cells; wall smooth, the gelatinous coating 4.5–6 μ thick.

On leaves and stalks of *Gentiana calycosa* Griseb., western North America.

Material examined:

British Columbia: *Barr 388* (UBC). Wyoming: Overlook, Skyline Trail, Teton Nat. Park, Moran, 5 Aug 1940, *Wehmeyer* (paratype of *S. gentianae,* MICH).

In sections of mature ascocarps the interthecial tissue is scarcely recognizable, for the asci are quite numerous and stand closely together. Above the asci remnants of interthecial tissue are present, and younger material does show asci arising in this tissue. In both *W. gentianae* and *W. macrotheca* the globules in the cells of the ascospores are lenticular, not globose. The lenticular type of globule is found in a number of species in *Lophiostoma* and *Massaria*, for example, in the Pleosporales.

Pyrenophora Fr. Summa Veget. Scand. 397. 1849.

= *Macrospora* Fuckel, Symb. Mycol. 139. 1870.
= *Polytrichia* Sacc. Syll. Fungorum 1: 451. 1882.
= *Neilreichina* O. Kuntze, Rev. Gen. Pl. 2: 862. 1891.

Ascocarps immersed to erumpent, relatively large, depressed globose; wall usually composed of sclerotial cells, forming *textura angularis*; surface bearing septate setae and/or conidiophores. Asci few in interthecial tissues, saccate or clavate, bitunicate, at times with a refractive ring surrounding protruding cytoplasm at apex. Ascospores crowded or biseriate in the ascus, yellowish brown, elliptic-obovate or oblong (the ends rounded), 3–6(–7–8)-septate, with vertical septum in one or more mid cells, rarely into end cells; wall smooth, usually surrounded by a thick gelatinous coating.

Conidial state: *Drechslera* Ito. For details of the porospores and illustrations of a number of species see Shoemaker (1962).

Saprobic on leaves and culms of monocotyledons; widespread in subarctic and temperate Europe and North America.

Macrospora Fuckel was typified by "*Sphaeria scirpi* Fr.," later corrected to *S. scirpicola* DC. ex Fr. Wehmeyer (1961) was unable to locate a De Candolle specimen of the species, and found only a species of *Leptosphaeria* on the specimen cited by Fries (1823). Wehmeyer utilized *Sphaeria scirpi* Rabenh. as the earliest name for the fungus. Fuckel's (1870) concept is identical with that of Rabenhorst according to Wehmeyer, so *Macrospora* must be relegated to synonymy with *Pyrenophora.*

The generic names *Polytrichia* and *Neilreichina* were based on *Sphaeria polytricha* Wallr. which is a species of *Pyrenophora. Pleospora* subgenus *Scleroplea* Sacc. (Syll. Fungorum 2: 277. 1883) has been considered a synonym of *Pyrenophora.* Included in this subgenus were *P. nuda* (Cooke) Sacc. & Syd. which is synonymous with *Pleospora scrophulariae* according to Wehmeyer (1961), and *P. sclerotioides* (Speg.) Sacc. & Syd. and *P. trochila* (Fr.) Sacc. & Syd., both of which Wehmeyer listed as doubtful species. Von Höhnel (1907b) emended the concept of *Scleroplea* (Sacc.) Oud. (Kon. Akad. Amsterdam 9: 152. 1900) and distinguished it from *Pyrenophora* by the absence of setae on the ascocarps. This characteristic is not sufficient to delimit genera.

The history of the genus *Pyrenophora* Fries was reviewed by Shoemaker (1961), who concluded that the genus was distinct from *Pleospora.* Wehmeyer, also in 1961, accepted *Pyrenophora* Fuckel non Fries, with type species *P. phaeocomes,* although earlier (1953) he had proposed that the species of *Pyrenophora* be included in *Pleospora.* According to Wehmeyer's (1954) developmental study of *Pleospora trichostoma* which belongs to *Pyrenophora,* and to Müller's (1951b) figure of a section through an ascocarp of *P. phaeocomes,* it is evident that locule development is of the *Pseudosphaeria* rather than the *Pleospora* developmental type. For this reason *Pyrenophora* is arranged in the Pseudosphaeriaceae. Von Höhnel (1907b) had already come to this conclusion after studying *P. phaeocomes* and *P. trichostoma,* when he included *Pyrenophora* in his enlarged concept of the Pseudosphaeriaceae. Thiessen (1916) accepted von Höhnel's disposition of *Pyrenophora.*

Type species: *P. phaeocomes* (Reb. ex Fr.) Fries.

Pyrenophora phaeocomes (Reb. ex Fr.) Fr. Summa Veget. Scand. 397. 1849.

Ascocarps 300–600 μ diam, depressed globose; wall sclerotial and thick, setose on upper surface. Asci 200–450 × 20–80 μ. Ascospores 55–100 × 25–40 μ, yellowish brown or dull brown, 6 (–7)-septate; primary septum supramedian, with vertical septum in all cells.

Conidial state: *Drechslera.*

On *Holcus* spp., Europe.

Wehmeyer (1961) provided additional details of synonymy for this fungus which has not yet been recognized in North America. The large ascospores with vertical septum through all cells are distinctive.

Additional species:

Pyrenophora schroeteri Barr, nom. nov. Figure 26.

≡ *Pleospora macrospora* Schroet. Jahresb. Schles. Ges. Vaterl. Cult. 58: 176. 1881; Hedwigia 21: 153. 1882, *non* Fuckel, Symb. Mycol. 138. 1870, nec de Not. Mém. Acad. Sci. Turin 7, nomen nudum. 1842, Ces. & de Not. Comm. Soc. Critt. Ital. 1: 218. 1863.

≡ *Clathrospora macrospora* (Schroet.) Nannf. Mitt. Bot. Inst. TH. Wien 8: 30. 1931.

≡ *Pyrenophora macrospora* (Schroet.) Wehm. World Monog. Genus *Pleospora* 278. 1961.

Ascocarps 250–300 μ diam, globose, the apex short papillate; wall of sclerotial cells, these 20–24 μ thick externally; inner layers of thin walled cells, light yellowish brown, ca. 24 μ thick. Asci 125–165 × 33–40 μ, broad clavate, with refractive ring around protruding cytoplasm in apex. Ascospores 35–42 × (12–)15–18(–21) μ, yellowish brown, broadly elliptic, 3-septate, not or slightly constricted at septa, with vertical septum in one or both mid cells; thin gelatinous coating present at times.

On culms of Gramineae, Europe, North America.

Material examined:

Northwest Territories: *Bartlett 2950* (MICH). British Columbia: *Barr 464* (UBC). Ontario: *Ell. & Ev. N.A.F. 3118.*

Pyrenophora schroeteri has 3-septate ascospores much like those of *P. trichostoma,* but they are usually paler in color and thinner walled in the former. The ascocarps of *P. schroeteri* are smaller and have a thinner wall than those of *P. trichostoma.*

Pyrenophora scirpi (Rabenh.) Wehm. World Monog. Genus *Pleospora* 287. 1961. Figures 23–25.

≡ *Sphaeria scirpi* Rabenh. Herb. Mycol. Europ. n. 456. 1837.

≡ *Pleospora scirpi* (Rabenh.) Ces. & de Not. Comment. Soc. Critt. Ital. 1: 217. 1863.

= *Pleospora aquatica* Griffiths, Bull. Torrey Bot. Club 26: 443. 1899.

Ascocarps 100–250 μ diam, globose or depressed; wall relatively thin, 16–20 μ thick, the surface glabrous or nearly so. Asci 77–120 × 24–30 μ, broadly clavate. Ascospores 25–31(–54) × 10–13(–20) × 9–11(–12.5) μ, yellowish brown, obovate, somewhat compressed and elliptic in side view, 5-septate, with vertical septum in one or all mid cells.

On *Eleocharis* and *Scirpus,* Europe, North America.

Material examined:

South Dakota: *Griffiths West Amer. Fungi 11* on *Eleocharis palustris* (L.) R. & S. (isotype of *Pleospora aquatica*).

Wehmeyer (1961) discussed this species and provided several additional synonyms for it. The measurements of ascospores for Griffiths' material range smaller than do those for European specimens. In the description above, the ascospore sizes in parentheses are the upper end of the size range reported by Wehmeyer from European collections. Five-septate ascospores are found in both *P. scirpi* and *P. polytricha.* Ascocarps distinguish the two species: those of *P. polytricha* are 400–600 μ diameter and have a thick sclerotial wall.

Wehmeyer (1961) treated several other species within the genus, including *P. trichostoma.* Shoemaker (1962) considered that several species which could be distinguished by their conidial states had been merged under *P. trichostoma* by Wehmeyer.

Dermatina Almq. Kongl. Svenska Vetenskapsakad. Handl. 17(6): 8. 1880.

= *Mycoporum* Flotow in Körob. Grunds. Kräuterk. 199. 1848, *non Mycoporum* Mey. 1825 (synonym of *Melanotheca*).

Ascocarps aggregated, usually multiloculate, depressed globose or irregular, superficial with bases embedded in thin crustose thallus composed of sloughed periderm cells, fungal hyphae and algal cells (*Palmella* sec. Fink 1935; *Trentepohlia* sec. Kreisel 1969); ascocarp wall of several layers of polygonal brown cells, forming *textura angularis,* narrowed at base; apical pore rounded and indistinct. Asci ovate or saccate, few in interthecial tissue, bitunicate, sessile. Ascospores crowded in the ascus, obovate or elliptic, hyaline becoming dull brown, straight to inequilateral, several-septate, constricted at primary septum, with one vertical septum through all cells; contents homogenous or minutely guttulate; wall smooth, surrounded by gelatinous coating.

On bark of trees, widespread and probably cosmopolitan in temperate regions.

In lichen classification, *Dermatina* is a genus of the Mycoporaceae. The family was placed in the Dothideales by Clements and Shear (1931) and in the Pleosporales by Hale (1961), but most authors have kept lichenized separate from non-lichenized genera. The type species of *Dermatina* produces ascocarps in which the asci are separated by interthecial tissue. The aspect is of the *Pseudosphaeria* type of development. Other genera placed in the family according to Riedl's recent revisionary studies (1962, 1963, 1964) seem to include both *Dothidea* and *Pleospora* types of development. None of the other representatives of genera in Mycoporaceae which I have studied have a similar developmental type to *Dermatina.* They must be treated within the framework of the Pleosporales.

Type species: *D. elabens* (Schaer.) A. Zahlbr.

Dermatina elabens (Schaer.) A. Zahlbr. Cat. Lichen. Univ. 1: 548. 1922. Figures 27–29.

≡ *Lecidea elabens* Schaer. Lichen. Helv. Spicil. 199. 1833.
≡ *Mycoporum elabens* (Schaer.) Flot. in Nyl. Actes Soc. Linn. Bordeaux 21: 417. 1856.
≡ *Arthonia elabens* (Schaer.) Boist. Nouv. Flore Lichen. 2: 256. 1903.
= *Arthothelium flotowianum* Körb. Parerg. Lichen. 261. 1861.
≡ *Dermatina flotowianum* (Körb.) Arnold, Flora 64: 204. 1881.
≡ *Curreya* (*Curreyella*) *flotowianum* (Körb.) v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. 118: 74. 1909.

Thallus thin, forming a dull yellowish crust on surface of bark; ascocarps black, depressed globose to irregular, 550–1000 μ diam, 350–385 μ high; locules poorly defined, composed of small groups of asci in interthecial tissue, the groups separated by hyaline cells. Asci 60–95 × 22–35 μ, saccate. Ascospores 24–28 × 9–11 μ, hyaline becoming dull brown, obovate or elliptic, 7-septate, constricted at primary septum, with vertical septum extending through all cells, often oblique in end cells; contents minutely guttulate; gelatinous coating present.

On bark of trees, Europe.

Material examined:

Switzerland: circa Wachseldorn, *Schaerer 232* (MASS).

The synonymy was provided by Riedl (1964).

Additional species:

Dermatina pyrenocarpa (Nyl.) Zahlbr. in Engler & Prantl, Natürl. Pflanzenfam. 2 Aufl. 8: 93. 1926. Figures 30–31.

≡ *Mycoporum pyrenocarpum* Nyl. Flora 41: 381. 1858.

Thallus crustose, thin, grayish; ascocarps black, depressed globose to irregular, separate or multiloculate, (250–)770–1000 μ diam, 165–250 μ high; locules small, 150–200 μ diam, separated by hyaline or brown cells. Asci 75–80 × 35–40 μ, saccate, few in locule. Ascospores 30–40 × 10–12 μ, hyaline, light dull brown in age, elliptic to obovate (lower end pointed at times), 3–7-septate, constricted at primary septum, with one vertical septum through all or most cells; thin gelatinous coating surrounding ascospores.

On bark of trees, North America.

Material examined:

Massachusetts: Spencer, 1884, *G. E. Stone* (MASS).

The larger ascospores and dull colored thallus separate this species from *Dermatina elabens.*

Dothioraceae Theiss. & Sydow, Ann. Mycol. 15: 444. 1917.

≡ *Botryosphaeriaceae* Theiss. & Sydow, Ann. Mycol. 16: 16. 1918; Müller & von Arx, Ber. Schweiz. Bot. Ges. 60: 389. 1950.

Ascocarps pulvinate, globose, depressed, or conic, uni- or multiloculate, opening at maturity by a large irregular area or broadly rounded pore; wall thick, of large cells, blackened externally, forming *textura angularis,* often vertically oriented in rows; locule in early stages filled with vertically oriented rows of hyaline cells. Asci clavate with foot-like base, tapered to a short or long stipe, bitunicate, octo- or polysporous, arising from a thick basal layer or modified cone or column of hyaline cells, growing into locule tissue and compressing this, appearing aparaphysate at maturity. Ascospores overlapping biseriate or crowded in the ascus, hyaline, yellowish, or light brown, rarely dark brown, obovate or elliptic, often tapering to base, one-celled or one- to several-septate, at times with vertical septum in one or more cells; contents minutely guttulate or granular; wall smooth, at times surrounded by a gelatinous coating.

Conidial state where known: *Dothichiza, Dothiorella, Botryodiplodia, Phyllostictina, Macrophoma, Hadrotrichum, Dothistroma.*

On living or dead woody branches or leaves of gymnosperms and angiosperms, occasionally on culms of monocotyledons, cosmopolitan.

Theissen and Sydow (1917) arranged the genera *Bagnisiella, Yoshinagaia, Wettsteinina, Pseudosphaeria,* and *Dothiora* in their family 6. Dothioraceae of the Myriangiales. Previously (1915) they included these and other genera in an "Anhang" to their arrangement of the Dothideales. Of the genera listed above, *Yoshinagaia* P. Henn. is extralimital and the remainder are included in the present treatment of this family or of the Pseudosphaeriaceae. Müller and von Arx (1950) discussed the *Dothiora* line of development and provided the ordinal name Dothiorales to include the Botryosphaeriaceae, Dothioraceae, Hysteriaceae, and Phacidiaceae. Representatives of the latter two families differ from those of the Botryosphaeriaceae and Dothioraceae and by 1954 Müller and von Arx had separated the Phacidiaceae into the Phacidiales. Müller and von Arx included species with one-celled ascospores in the Botryosphaeriaceae and species with septate ascospores in the Dothioraceae (von Arx and Müller 1954, Müller and von Arx 1962). Luttrell (1951b) included the Dothioraceae in the Pseudosphaeriales, as had Nannfeldt (1932) and others, but by 1955 Luttrell recognized that members of the Dothioraceae exhibited the *Dothidea* developmental type and transferred the family to the Dothideales.

Key to Genera

1. Ascospores one-celled; asci octosporous.
   2. Ascocarps pulvinate, single broad locule in upper portion. *Bagnisiella.*
   2. Ascocarps depressed globose or conic, uni- or multi-loculate. *Botryosphaeria.*
1. Ascospores one- to several-septate; asci octo- or poly-sporous.
   3. Ascospores one-septate (occasionally becoming two-septate).
      4. Asci polysporous. *Delphinella.*
      4. Asci octosporous.
         5. Ascocarps uni- or multiloculate, globose or elongate, immersed or erumpent. *Scirrhia.*
         5. Ascocarps multiloculate, peltate, superficial on erumpent foot-like hypostroma. *Coccoidella.*
   3. Ascospores several-septate; vertical septum sometimes formed.
      6. Asci polysporous. *Sydowia.*
      6. Asci octosporous.
         7. Ascocarps medium to large, uni- or multiloculate, depressed pulvinate or elongate; asci arising from plane base of locule or from low cushion of hyaline cells. *Dothiora.*
         7. Ascocarps small, uniloculate, globose; asci arising from central conic protrusion or column of hyaline cells in base of locule. *Saccothecium.*

Bagnisiella Speg. Fungi Argent. 3: 22. 1880.

Ascocarps pulvinate, immersed in periderm, soon erumpent, scattered or grouped; apex plane or depressed, opening widely and irregularly at maturity; wall of sclerotial or thin-walled cells, large, forming *textura angularis,* arranged in upright rows, blackened externally, brownish to hyaline within; locule in upper portion, broad, when immature composed of hyaline, thin-walled cells. Asci clavate oblong, bitunicate, octosporous, parallel, arising from base of locule into cells which become compressed or dissolved. Ascospores overlapping bi- to triseriate in the ascus, hyaline, narrowly elliptic, tapered to pointed ends, one-celled, straight to inequilateral; contents minutely guttulate; wall smooth.

Conidial state not known.

On woody branches, cosmopolitan.

Bagnisiella is a taxon which could be interpreted as an advanced member of the Myriangiales, or as a genus of the Pseudosphaeriaceae, with remnants of locule cells persisting at times between as well as above the asci. The pulvinate ascocarps and parallel asci are typical of the family Dothioraceae, however, and *Bagnisiella* is considered a primitive member of this family.

The genus *Columnosphaeria* Munk (1953) has ascospores similar to those of *Bagnisiella,* but the asci arise from a basal column of cells as do those of *Saccothecium* and also *Phyllachorella.* Although von Arx and Müller (1954) treated Munk's genus as a synonym of *Guignardia* and the type species as a synonym of *G. cytisi* (Fuckel) v. Arx & Müller, Munk (1957) reiterated his belief in the position of *Columnosphaeria* as a genus parallel to *Saccothecium* (sub *Pringsheimia*) and closely related to *Botryosphaeria* in ascospore characteristics.

Type species: *B. australis* Speg.

Bagnisiella australis Speg. Fungi Argent. 3: 22. 1880. Figures 32–34.

Ascocarps 550–1100 μ diam, 275–550 μ high, or larger and irregular in shape if closely grouped and connected, pulvinate; wall of thin or thick walled cells; locule occupying upper third of stroma beneath outer blackened wall layers. Asci 60–90 × 16–27 μ. Ascospores 22–33 × 6–8 μ.

On woody branches, cosmopolitan.

Material examined:

Kansas: Concordia, 20 Apr 1907, on *Morus, Bartholomew* (BPI). Texas: Del Rio, 13 Mar 1903, on *Prosopis, C. L. Shear* (BPI).

Both of these collections were determined by Dr. F. Petrak. They agree with the description of *Bagnisiella australis* from Argentina on *Acacia* branches.

Another North American species which has been included in the genus is *B. arctostaphyli* (Plowr.) Theiss. Ann. Mycol. 14: 332. 1916. A specimen in NY from Yosemite Valley, California, *Harkness 3528,* does not have ascigerous locules. The ascocarps are similar in appearance and structure to those of *B. australis,* although smaller; the locule is occupied by numerous hyaline conidia of the *Dothichiza* type. Ellis and Everhart (1892) noted that only "spermogonia" were present on the specimens they examined.

Botryosphaeria Ces. & de Not. Comment. Soc. Critt. Ital. 1: 211. 1863; emend. Sacc. Michelia 1: 42. 1877, Syll. Fungorum 1: 456. 1882.

Von Arx and Müller (1954) synonymized a number of genera under *Botryosphaeria;* repetition of their listing is avoided here. The following synonym was added by Petrak (1958b):

= *Guignardia* Viala & Ravaz, Bull. Soc. Mycol. France. 9: 63. 1892.

Ascocarps immersed to erumpent, depressed globose to conic, uni- or multiloculate, scattered to grouped, medium or large; apex rounded or papillate, opening widely at maturity; wall thick, several layers of cells forming *textura angularis* or *textura globosa,* the outer layers blackened and thick walled; inner layers of hyaline to yellowish small polygonal cells, forming a broad basal cushion and lining sides of locule and filling apical pore region until maturity. Asci clavate or oblong, stipitate or sessile, arising from broad base of locule into and dissolving locule cells. Ascospores hyaline or yellowish, becoming brown at times, elliptic, obovate or obtrullate at times, one-celled, often inequilateral; contents granular or minutely guttulate; wall smooth, at times surrounded by gelatinous coating or appendage(s) at one or both ends.

Conidial states: Pycnidia uni- or multiloculate, the wall relatively thick; conidiophores short and indistinct, lining locule; conidia hyaline or brown, one-celled or one-septate. Described as: 1) *Dothiorella,* conidia one-celled, hyaline, fusoid. The *Dothiorella* state of *Botryosphaeria dothidea* is illustrated by Shoemaker (1964) and von Arx (1970). 2) *Phyllostictina,* conidia one-celled, hyaline, oblong, often with gelatinous appendages. The *Phyllostictina* state of *B. philoprina* is illustrated by von Arx (1970). 3) *Botryodiplodia,* conidia one-celled or septate, becoming brown, oblong (illustrated by Shoemaker 1964). Also conidial states are described under *Macrophoma* and *Lasiodiplodia.*

On woody branches or leaves of gymnosperms and angiosperms, culms of monocotyledons, herbaceous stalks or leaves of dicotyledons; cosmopolitan.

Von Arx and Müller (1954) regarded both *Botryosphaeria* and *Guignardia* as genera of the family Botryosphaeriaceae. They separated *Botryosphaeria* from *Guignardia* particularly on the basis of larger sizes in *Botryosphaeria,* and designated certain species as intermediate between the two genera because of intermediate size. *Guignardia* was established by Viala and Ravaz (1892) to replace *Laestadia* Auersw. 1869, predated by *Laestadia* Lessing 1832 (a genus of Compositae). However, Viala and Ravaz did not realize that the type species, *Laestadia alnea* (Fr.) Auersw. differed generically from *Guignardia bidwellii* (Ellis) Viala and Ravaz, the species they discussed at that time. Von Höhnel (1918) noted the differences and transferred *L. alnea* to *Gnomonina.* He concluded that *Guignardia* in the sense of *G. bidwellii* was identical with *Phyllachorella* Syd. Sydow (1919) correctly showed that *Guignardia* was a replacement for *Laestadia* Auersw. so that *L. alnea* must be retained as the type of *Guignardia* and *Gnomonina* v.Höhnel become a synonym of *Guignardia.* The majority of workers, from Schroeter (1894) and Lindau (1897) to the present time, have accepted *Guignardia* as the name for a number of small species with one-celled ascospores. Unfortunately, both bitunicate and unitunicate ascus types were involved.

While the delimitation of *Guignardia* in the sense of *G. bidwellii* by von Arx and Müller (1954) resulted in a more closely related group of species, problems still occurred in distinguishing between small species of *Botryosphaeria* and large species of *"Guignardia."* Consequently, the genera could not be clearly defined. Petrak (1958b, 1968) proposed that *Botryosphaeria* include those species of *"Guignardia"* in which the asci pushed irregularly (not all developing at the same time) into the locule tissue which finally became compressed between the asci. These species included *G. bidwellii,* as well as those species which were intermediate between *Botryosphaeria* and *"Guignardia"* in von Arx and Müller's (1954) interpretation. As an additional characteristic uniting all the species of *Botryosphaeria,* Petrak utilized the conidial states. Petrak recognized four divisions of *Botryosphaeria* in his study: 1) species with well-developed prosenchymatic stroma, large locules, large ascospores, on woody branches; 2) species with well-developed or slight pseudo- or prosenchymatic stroma, medium to large locules, medium-sized ascospores, on woody branches; 3) species without stroma, perithecium-like, medium to large locules, medium to large ascospores, on grasses, or herbaceous stalks, rarely leaves; and 4) species without stroma, medium to small perithecium-like locules, medium to small ascospores, mostly on leaves. The fourth group of species he typified by *B. bidwellii* and in it he included several of the difficult "intermediates" between *Botryosphaeria* and *"Guignardia."* The remaining species of *"Guignardia,"* which Petrak noted had a different development—the asci developing at almost the same time and locule tissue disintegrating early—could be accommodated in the genus *Discosphaerina* in the Dothideaceae.

Originally I had recognized *Botryosphaeria* and *Guignardia* as amerosporous representatives of the families Dothioraceae and Dothideaceae respectively. The species of *"Guignardia"* fell into two groups: the *G. bidwellii* group with relatively thick walled, usually globose to conic ascocarps, and relatively few asci, and the *G. discophora* group with thin walled ascocarps, depressed globose, and relatively numerous asci. By transferring the *G. bidwellii* group to *Botryosphaeria* where they appear to belong, and by recognizing *Discosphaerina* for the species typified by *D. discophora,* clear demarcation of the genera can be provided. The conidial states are also different. Pycnidia of species of *Botryosphaeria* have a large-celled wall much like that of the perfect state. In *Discosphaerina* the conidial state is produced in pycnidia with a thin wall of small lighter colored cells.

The extralimital *Phyllachorella* Sydow with the type species *P. micheliae* Sydow belongs in the Dothioraceae and is closely related to *Botryosphaeria.* Multiloculate ascocarps are parasitic on living leaves of *Michelia* species. The dome-shaped basal cushion from which the asci arise provides generic distinction. The aspect is similar to that in *Saccothecium. Phyllachorella* bears much the same relationship to *Botryosphaeria* as does *Saccothecium* to *Dothiora* or *Columnosphaeria* to *Bagnisiella.*

In North America the species of *Botryosphaeria* may be grouped much as in Petrak's (1958b) interpretation, although I combine his first two groups and divide the genus into three sections.

Key to Sections

1. Fungi on woody dicotyledon branches; ascocarps multi- or uniloculate and connected by hyphae; ascospores medium-sized to large. Section *Botryosphaeria.*
1. Fungi on gymnosperms, monocotyledons, or herbaceous dicotyledons; ascocarps usually uniloculate.
   2. On gymnosperms or monocotyledons; ascospores medium-sized to large. Section *Pyreniella.*
   2. On herbaceous dicotyledons; ascospores small to medium-sized. Section *Discochora.*

Botryosphaeria section **Botryosphaeria**.

Lectotype species: *B. dothidea* (Moug. ex Fr.) Ces. & de Not.

Several different species have been chosen as lectotype of the generic name. Cesati and de Notaris included fourteen species in the original delimitation of *Botryosphaeria.* The first species was *B. pulicaris* which is *Gibberella pulicaris.* Theissen and Sydow (1915) suggested that *B. quercuum* (Schw.) Sacc. be chosen as lectotype, since it was typical of Saccardo's emendation of *Botryosphaeria.* Von Arx and Müller (1954) accepted *B. quercuum* as the type species. This was not one of the original species of the genus. Von Höhnel (1909) designated *B. beringeriana* de Not. as type, but de Notaris published that species some years after the genus was proposed. It is now considered to be synonymous with *B. dothidea* (von Arx and Müller 1954). Because *B. dothidea* was one of the original species of the genus and also conforms to Saccardo's emended description, I propose this species as lectotype of *Botryosphaeria.*

Botryosphaeria dothidea (Moug. ex Fr.) Ces. & de Not. Comment. Soc. Critt. Ital. 1: 212. 1863. Figures 35–37.

For a number of synonymous names, see von Arx and Müller (1954).

Ascocarps 200–250 μ diam, 150–200 μ high, globose depressed, thickly grouped and at times connected; wall 27–39 μ thick. Asci 55–75 × 13–18.5 μ. Ascospores (12–)15–24 × (5.5–)6–10 μ, elliptic to obovate, apex obtuse, base pointed; gelatinous coating sometimes surrounding spores.

Conidia 12–30 × 4–8(–10) μ, hyaline, fusoid, one-celled.

On branches of woody plants, cosmopolitan.

Material examined:

Massachusetts: *Guba, Nantucket Fungi 88* (as *Sphaeropsis malorum,* MASS). New York: *Fungi Columbiani 3407, 3408, 3409* (as *B. ribis*) Michigan: *Barr 1462* (MASS). North Carolina: Raleigh, March 1924, *F. A. Wolf* (on type of *Sphaerulina polyspora* Wolf, BPI). Alabama: *Alabama Fungi 8, R. P. Burke* (NY).

Additional species:

Botryosphaeria quercuum (Schw.) Sacc. Syll. Fungorum 1: 456. 1882. Figure 38.

Von Arx and Müller (1954) examined many collections and provided a long synonymy for this species. Add to synonymy:

= *Sphaeria eunotiaespora* Cooke & Harkness, Grevillea 13: 18. 1884.
≡ *Wallrothiella eunotiaespora* (Cooke & Hark.) Berl. & Vogl. Addit. Syll. Fungorum 68. 1886.

Ascocarps usually multiloculate, 250–450 μ diam, 250–400 μ high; wall thick especially over apex, 50–60(–100) μ thick. Asci 100–110 ×21–25 μ. Ascospores (26–)30–36 × (10–)12–16 μ, hyaline to yellowish, elliptic, the ends obtuse.

Conidia (18)–21–25 × (10–)14–17 μ, hyaline, one-celled.

On branches of woody dicotyledons, cosmopolitan.

Material examined:

New York: *Ascomycetes and Lower Fungi 51; New York Fungi 373; Ell. & Ev. N.A.F. 3264* (as *Dothiorella quercina*). New Jersey: Malaga, 22 Sept 1878, *Ellis* (as *Dothidea moricola,* NY). North Carolina: *Ravenel Fungi Car. 62* (as *Sphaeria mutila*), *58* (as *Sphaeria quercuum*). California: San Francisco, Feb 1881 (type of *Sphaeria eunotiaespora,* CAS).

Botryosphaeria obtusa (Schw.) Shoemaker, Canad. J. Bot. 42: 1298. 1964.

≡ *Sphaeria obtusa* Schw. Trans. Amer. Philos. Soc. II. 4: 220. 1832.
= *Physalospora corni* Ell. & Ev. Proc. Acad. Nat. Sci. Philadelphia 47: 427. 1896, *non P. corni* Sacc.
≡ *Physalospora everhartii* Sacc. & Sydow, Syll. Fungorum 14: 521. 1899.

Ascocarps usually uniloculate, 210–280 μ diam, 140–175 μ high, depressed globose. Asci 63–120 × 16–25 μ. Ascospores 22–27(–32) × 6.5–12 μ, hyaline to yellowish, elliptic or obovate, the ends obtuse or pointed.

Conidia (14–)20–28 × (7–)10–12(–16) μ, brown, 1-celled or 1-septate.

On woody dicotyledons, North America.

Material examined:

Ontario: *Fungi Columbiani 4704* (as *B. hamamelidis*). Massachusetts: West Deerfield, 4 Mar 1970, *Ahles* (MASS). New York: Hyde Park, 25 Feb 1968, *Ahles* (MASS). Colorado: *Ell. & Ev. N.A.F. 3322* (as *Physalospora corni*). Missouri: *Fungi Columbiani 2609* (as *B. delilei*).

The conidial state has been issued in a number of exsiccati: *Fungi Columbiani 2483* and *Ell. & Ev. N.A.F. 3550* as *Sphaeropsis mali; Economic Fungi 421* as *S. malorum; Ell. & Ev. N.A.F. 3549* as *S. juglandis.*

Botryosphaeria melanops (Tul.) Winter in Rabenh. Kryptogamenfl. 1(2): 800. 1887.

For synonymy of this species and a discussion of its distinguishing characteristics see Shoemaker (1964). The ascospores measure (31–)34–36(–49) × (14–)16–18(–21) μ and the hyaline conidia (41–)47–50(–53) × (9–)10–11 μ. The fungus is apparently cosmopolitan on branches of *Quercus.*

Botryosphaeria section **Pyreniella** (Theiss.) Barr, comb. nov.

≡ *Pyreniella* Theiss. Verh. Zool.-Bot. Ges. Wien 66: 371. 1916.

Type species: *B. festucae* (Lib.) v. Arx & Müller.

Botryosphaeria festucae (Lib.) v.Arx & Müller, Beitr. Kryptogamenfl. Schweiz 11(1): 38. 1954.

For a number of synonymous names see von Arx and Müller (1954). Add to synonymy:

= *Dothidea dasylirii* Peck, Bot. Gaz. 7: 57. 1882.
≡ *Phyllachora dasylirii* (Peck) Sacc. Syll. Fungorum 2: 606. 1883.
≡ *Botryosphaeria dasylirii* (Peck) Theiss. & Syd. Ann. Mycol. 13: 663. 1915.

Ascocarps 300–450 μ diam, globose or somewhat depressed, uni- or few-loculate, usually with conspicuous papillate apex; wall thick, 40–60 μ thick. Asci 85–110 × 20–28 μ. Ascospores 22–35 × 7.5–15 μ, hyaline to yellowish, elliptic, often tapered to pointed base; cap-like gelatinous coating present over basal end at times.

On leaves or culms of large monocotyledons, Europe, North America.

Material examined:

Alaska: Atak, 2 Aug 1948, *Bank* (MICH). Louisiana: St. Martinsville, 20 Oct 1888, *Langlois* (type of *Physalospora conica,* NY). Arizona: May 1881, *Pringle* (type of *Dothidea dasylirii,* NYS).

Von Arx and Müller (1954) synonymized *Dothidea dasylirii* under *B. quercuum.* However, the host plant and slightly smaller ascospores of *D. dasylirii* suggest to me that it is better placed as a synonym of *B. festucae.*

Additional species:

Botryosphaeria abietina (Prill. & Delacr.) v. Arx & Müller, Beitr. Kryptogamenfl. Schweiz 11(1): 42. 1954.

≡ *Physalospora abietina* Prill. & Delacr. Bull. Soc. Mycol. France 6: 114. 1890.
≡ *Cryptosporina abietina* (Prill. & Delacr.) Theiss. Verh. Zool.-Bot. Ges. Wien 66: 394. 1916.

Ascocarps 245–300 μ diam, 180–280 μ high, depressed globose, scattered; wall thick, 50–90 μ thick. Asci 75–102 × 18–22.5 μ. Ascospores 18–24 × 7.5–9 μ, hyaline, elliptic to obovate, the ends obtuse or pointed.

On leaves and twigs of *Abies* spp., Europe, North America.

Material examined:

Quebec: *Barr 1936* (DAOM, MASS).

Three additional species described from conifers are included in this section. Descriptions may be found in the cited journals.

Botryosphaeria laricis (Wehm.) v.Arx & Müller, Beitr. Kryptogamenfl. Schweiz. 11(1): 42. 1954.

A recent description of this fungus and its conidial state was provided by Smerlis (1970b).

Botryosphaeria tsugae Funk, Canad. J. Bot. 42: 770. 1964.

Botryosphaeria piceae Funk, Canad. J. Bot. 43: 45. 1965.

Botryosphaeria section **Discochora** (v.Höhnel) Barr, comb. nov.

≡ *Discochora* v.Höhnel, Ber. Deutsch. Bot. Ges. 36: 315. 1918.

Type species: *B. philoprina* (Berk. & Curt.) v.Arx & Müller.

Botryosphaeria philoprina (Berk. & Curt.) v.Arx & Müller, Beitr. Kryptogamenfl. Schweiz 11(1): 40 1954.

Synonymy of this species was provided by von Arx and Müller (1954).

Ascocarps 200–230 μ diam, 120–160 μ high, depressed globose, immersed, mostly epiphyllous, thickly scattered; wall 20–24 μ thick. Asci 60–77 × 12–14.5 μ. Ascospores 12–16.5 × 4.5–6 μ, hyaline, elliptic to obtrullate, straight to inequilateral, the ends obtuse; gelatinous cap-like appendage at both ends, 1–2.5 μ high, 2.5–3.5 μ wide.

Conidial state: *Phyllostictina ilicicola* (Cooke & Ell.) v.Höhnel. *Macrophoma ilicella* (Sacc. & Penz.) Berl. & Vogl. Bonar (1934) described the results of cultural studies of the *Macrophoma* state.

On dead leaves of *Ilex* spp., Europe, Asia, North America.

Material examined:

Massachusetts: *Barr 4832* (MASS). Rhode Island: *Barr 4833* (MASS). New Jersey: *Ellis N.A.F. 196* (as *Sphaeria ilicis* Schleich.). Maryland: *Barr 4863* (MASS). North Carolina: *Ravenel, Fungi Carol. Exs. Fasc. IV, n. 63* (as *Sphaeria ilicis*).

Additional species:

Botryosphaeria bidwellii (Ell.) Petrak, Sydowia 11: 440. 1958 ["1957"]. Figures 39–41.

≡ *Sphaeria bidwellii* Ellis, Bull. Torrey Bot. Club 9: 90. 1880.
≡ *Physalospora bidwellii* (Ell.) Sacc. Syll. Fungorum 1: 441. 1882.
≡ *Laestadia bidwellii* (Ell.) Viala & Ravaz, Progr. Agric. & Vitic. 492. 1888; Ell. & Ev. North Amer. Pyrenomyc. 262. 1892.
≡ *Sphaerella bidwellii* (Ell.) Ell. Cat. Pl. New Jersey 552. 1890.
≡ *Guignardia bidwellii* (Ell.) Viala & Ravaz, Bull. Soc. Mycol. France 8: 63. 1892.
≡ *Carlia bidwellii* (Ell.) P. Magnus, Bull. Soc. Mycol. France. 9: 174. 1893; Prunet, Rev. Gen. Bot. 10: 127. 1892.
≡ *Phyllachorella bidwellii* (Ell.) Theiss. Verh. Zool.-Bot. Ges. Wien 69: 11. 1919.

Ascocarps 120–150 μ diam, globose or conic with erumpent papillate apex, thickly grouped and connected by dark brown cells which may form a crust up to 30 μ thick; wall 10–15 μ thick. Asci 50–65 × 11–14.5 μ. Ascospores 12–13.5 × 5.5–6.5 μ, hyaline, obovate or obtrullate, straight to inequilateral, the ends obtuse.

Conidial state: *Phyllostictina uvicola* (Berk. & Curt.) v.Höhnel. Conidia 5–8 × 3–4 μ, hyaline, elliptic, one-celled. Microconidial state: conidia 4–6 × 0.5 μ, hyaline, rod-shaped, one-celled.

On fruits and branches of *Vitis* spp., North America, Europe.

Material examined:

Massachusetts: *Barr 2870* (MASS); *Guba, Nantucket Fungi 148*; Jefferson, Aug 1917, *Kendall* (MASS); *Laird 10* (MASS). Florida: Gainesville, 4 Aug 1922, *Weber* (MASS).

The globose or conic widely erumpent ascocarps of this and the following species differentiate them from the remaining species in *Botryosphaeria* section *Discochora,* of which the ascocarps are depressed globose or elliptic with the apex slightly erumpent.

Additional species:

Botryosphaeria spiraeae Barr, sp. nov.

Ascocarpia 120–180 μ diametro, globoso-conica, erumpentia, aggregata cum hyphis umbrinis, peridio 16.5–20 μ crasso. Asci 46–84 × 16–24 μ, oblongi vel saccati, bitunicati. Ascosporae 15.5–24 × 6.5–9 μ, hyalinae vel raro fuscae, ellipticae vel obovatae, unicellulares.

Specimen typicum in folius emortuis *Spiraeae latifoliae,* prope "Neighborhood Trail, near Johnson, Lamoille Co., Vermont, 11 Aug 1964," legit *M. E. Barr n. 4499*; in Herb. Univ. Mass. depositum.

Ascocarps 120–180 μ diam, globose conic, widely erumpent, in small groups surrounded by dark brown hyphae and forming blotches, amphigenous; wall 16.5–20 μ thick. Asci 46–84 × 16–24 μ. Ascospores 15.5–24 × 6.5–9 μ, hyaline, occasionally dull brown in age, elliptic or obovate, straight to inequilateral, the ends obtuse.

On overwintered leaves of *Spiraea latifolia* (Ait.) Borkh., still attached to branch, northeastern North America.

Material examined:

Vermont: *Barr 4499* (type, MASS).

This is a striking fungus, forming blackened blotches up to 3 mm across on leaves. The mycelium radiates from the hyphal center which contains a few ascocarps.

Botryosphaeria diapensiae (Rehm) Barr, Mycologia 62: 384. 1970.

≡ *Physalospora diapensiae* Rehm, Ann. Mycol. 6: 323. 1908.
≡ *Guignardia diapensiae* (Rehm) v.Arx & Müller, Beitr. Kryptogamenfl. Schweiz 11(1): 55. 1954.

Ascocarps 105–120 μ diam, 75–105 μ high, depressed globose, immersed, scattered, mostly epiphyllous; wall 15–18 μ thick. Asci 30–63(–88) × 15–21 μ. Ascospores (16.5–)18–27.5 × 4–6.5 μ, hyaline to yellowish, narrowly obovate, straight to slightly curved (the ends narrowed but obtuse), at times with narrow cap-like gelatinous appendage ca. 1 μ long over basal end.

On overwintered leaves of *Diapensia lapponica* L., Europe, North America.

Material examined:

Quebec: *Brunel 150; Marie-Victorin & Rolland-Germain 25136; Boivin & Blain 644* (DAOM, MASS). New Hampshire: *Barr 4096A* (MASS). Europe: Finland: Petsovmo: Linshamari, 8 July 1937, *Kari* (NY).

Botryosphaeria apocyni (Ell. & Ev.) Barr, comb. nov.

≡ *Laestadia apocyni* Ell. & Ev. Proc. Acad. Nat. Sci. Philadelphia 42: 230. 1891.

Ascocarps 120–165 μ diam, depressed globose, immersed, thickly scattered or grouped and connected by dark brown hyphae to form dull dark patches. Asci 40–52 × 9–14.5 μ. Ascospores 9.5–14.5 × 5–6.5 μ, hyaline, obovate, straight to inequilateral, the ends obtuse.

On dead stalks of *Apocynum* sp., eastern North America.

Material examined:

Ontario: *Ell. & Ev. N.A.F. 2540.*

Botryosphaeria smilacinina (Peck) Barr, comb. nov.

≡ *Sphaeria smilacinina* Peck, Annual Rep. New York State Mus. 29: 62. 1878.
≡ *Anthostomella smilacinina* (Peck) Sacc. Syll. Fungorum 1: 281. 1882.

= *Laestadia smilacinae* Dearn. & House, Bull. New York State Mus. 205–206: 53. 1918.
≡ *Guignardia smilacinae* (Dearn. & House) Dearn. & House, Bull. New York State Mus. 266: 73. 1925.

Ascocarps 100–150 μ diam, 100 μ high, depressed globose, immersed, with rounded erumpent apex, thickly scattered and connected by brown hyphae; wall 20 μ thick. Asci 38–53 × 12–18 μ. Ascospores 12–16.5 × 4.5–6.5 μ, hyaline to yellowish, broadly elliptic or obovate, straight to inequilateral, the ends obtuse; gelatinous cap-like appendage present at each end.

On overwintered leaves and stalks of *Smilacina stellata* (L.) Desf., eastern North America.

Material examined:

New York: Center, *C. H. Peck* (type of *Sphaeria smilacinina,* NYS); Karner, April, *C. H. Peck* (type of *Laestadia smilacinae,* NYS).

Evidently Saccardo's transfer of Peck's species to *Anthostomella,* based on the brief type description, misled Dearness and House into erecting *Laestadia smilacinae* for the same species. Specimens of the two collections are identical in all respects. Because Peck did not date his collections, the two cited above may have been part of the same collection (Karner = Center).

Botryosphaeria aesculi (Peck) Barr, comb. nov.

≡ *Laestadia aesculi* Peck, Annual Rep. New York State Mus. 39: 51. 1886.
≡ *Guignardia aesculi* (Peck) Stewart, Phytopathology 6: 9. 1916.

Ascocarps 148–200 μ diam, 115–150 μ high, depressed globose, immersed, thickly scattered; wall 16.5–23 μ thick. Asci 37–52 × 15–17 μ. Ascospores 13.5–18 × 6–8 μ, hyaline, obovate or elliptic, straight to inequilateral, the ends obtuse, rarely pointed.

Conidial state: *Phyllostictina sphaeropsoidea* (Ell. & Ev.) Petrak. Pycnidia mostly hypophyllous in leaf spots, 80–170 μ diam; conidiophores lining inner wall, short, 5 × 1.5 μ; conidia 10–15(–18) × 6–11.5 μ, broadly elliptic to nearly globose, hyaline, one-celled, with hyaline apical appendage. Microconidial state: *Asteromella aesculicola* (Sacc.) Petrak. Pycnidia in dead leaves, among ascocarps of immature ascal state, mostly hypophyllous, 40–80(–120) μ diam; conidiophores short, lining inner wall; conidia 3–6(–9) × 1–1.5(–3.5) μ, oblong, hyaline, one-celled, in gelatinous matrix.

The conidial state parasitic and causing dark reddish or brown leaf blotches, the perfect state in overwintered leaves and petioles of *Aesculus hippocastanum* L., *A. glabra* Willd., North America, Europe.

Material examined:

Massachusetts: *Barr 4157* (MASS). New York: Albany, 20 May 1885, *Clinton* (type, NYS); Orleans, 10 Aug 1913, *Diehl* (MICH, immature). Michigan: Lansing, Sept 1901, *Wheeler* (MICH, *Phyllostictina* state). District of Columbia: Washington, 17 Oct 1902, *Patterson* and *Dyre* (MICH, *Phyllostictina* state).

Stewart (1916) described and illustrated the development of the conidial, microconidial, and ascal states of this fungus. Petrak (1957) reported on the incidence of the disease in Europe. Three other species of the section were described and discussed recently:

Botryosphaeria vaccinii (Shear) Barr, Mycologia 62: 379. 1970.

Botryosphaeria rhodorae (Cooke) Barr, Mycologia 62: 381. 1970.

Botryosphaeria hyperborea Barr, Mycologia 62: 383. 1970.

Delphinella (Sacc.) Kuntze, Rev. Gen. Pl. 3(2): 74. 1898.

= *Hariotia* Karst. Bot. Morot. 3: 206. 1889, *non Hariota* Adans. 1763.
= *Glonium* Mühl. subgenus *Delphinella* Sacc. Syll. Fungorum 9: 1103. 1891.
= *Pleoglonis* Clements, Gen. Fungi 56, 173. 1909.
= *Rehmiellopsis* Bubák & Kabát, Naturwiss. Z. Forst- Landw. 8: 320. 1910.
= *Diplosphaerella* Grove, J. Bot. 50: 91. 1912.
= *Polycarpella* Theiss. & Sydow, Ann. Mycol. 16: 28. 1918.

Ascocarps globose, depressed, or conic, immersed, small to middle-sized; wall relatively thick, of few layers of large polygonal cells, brown, forming *textura angularis*. Asci bitunicate, polysporous, oblong, clavate, or saccate, the locule tissue compressed at maturity. Ascospores overlapping bi- to triseriate or crowded in the ascus, obovate or oblong, tapered from rounded apex to obtuse or pointed base, hyaline or yellowish, one-septate; wall smooth.

Conidial state where known: *Dothiorella*; conidia hyaline, one-celled, fusoid, formed in thick-walled pycnidia.

Saprobic or parasitic on leaves, twigs, and cone scales of gymnosperms, leaves and peduncles of woody dicotyledons, widespread in subarctic and temperate regions.

Müller (1953b) and Müller and von Arx (1962) discussed the generic synonyms of *Delphinella*.

Type species: *D. strobiligena* (Desm.) Clements & Shear.

Delphinella strobiligena (Desm.) Clements & Shear, Genera of Fungi, 49. 1931.

The type species has not yet been found in North America. Müller (1953b) provided description and synonymy of it.

Additional species:

Delphinella abietis (Rostr.) Müller in Müller & von Arx, Beitr. Kryptogamenfl. Schweiz 11(2): 26. 1962.

For synonymy of the species see Müller in Müller and von Arx (1962).

Ascocarps 145–200 μ diam, globose or depressed, immersed, the plane apex erumpent. Asci 50–90 × 18–22 μ, 16–32-spored. Ascospores not constricted at the median septum, 11–21 × 4–6.5 μ, hyaline, obovate, the ends obtuse.

Conidial state: *Dothiorella* (*Phoma bohemica* Bubák & Kabát). Pycnidia 150–200 μ diam, with aspect similar to that of ascocarps; conidia 10–16 × 4–6.5 μ, hyaline, fusoid, one-celled.

On living leaves of *Abies* spp., Europe, North America, Asia.

Waterman (1945) described and discussed this species which was found on *Abies lasiocarpa* in British Columbia. She compared it with the following species. *D. abietis* has narrower asci and smaller ascospores than does *D. balsameae*.

Delphinella balsameae (Waterman) Müller in Müller and von Arx, Beitr. Kryptogamenfl. Schweiz 11(2): 27. 1962. Figures 45–46.

≡ *Rehmiellopsis balsameae* Waterman, J. Agric. Res. 70: 327. 1945.

Ascocarps (135–)200–280 μ diam, 135–165(–200) μ high, globose or depressed, immersed with apex erumpent, thickly scattered; wall 15–40 μ thick. Asci 85–123 × 27.5–40 μ, 16-spored. Ascospores not constricted at the median septum, 26–38(–50) × 5.5–9(–12) μ, hyaline or yellowish, oblong or narrowly obovate, the ends obtuse.

On living leaves of *Abies* spp., northeastern North America.

Material examined:

Maine: Jim Pond Twp., 20 June 1940, *Waterman & Aldrich* (NYS). Massachusetts: Hamilton, *MacKenzie & Aldrich* (NYS); Hamilton, 3 Apr 1935, *Hansbrough* (MASS); Hamilton, 26 June 1935, *McKenzie* (MASS). New York: Lake George, Warren Co., 2 Nov 1933, *McKenzie & Aldrich* (NYS).

Apparently no conidial state is produced by this species. Waterman (1945) noted that cultures made from ascospores had a black yeast-like aspect, and that conidia were budded from hyphae. On sterilized *Abies* leaves which were inoculated with hyphae of *D. balsameae* only sterile fruiting structures were formed.

Delphinella tsugae (House) Barr, comb. nov. Figures 42–44.

≡ *Sphaerella tsugae* House, Bull. New York State Mus. 205–206: 40. 1919.
≡ *Mycosphaerella tsugae* (House) House, Bull. New York State Mus. 233–234: 31. 1921.
= *Sphaerella conigena* Peck, Annual Rep. New York State Mus. 38: 104. 1885, *non* Peck 1880, nec Ell. & Ev. 1891.
= *Sphaerella peckii* Sacc. Syll. Fungorum 9: 649. 1891, *non* Speg. 1880.
≡ *Mycosphaerella peckii* (Sacc.) Lindau in Engler & Prantl, Natürl. Pflanzenfam. 1(1): 425. 1897.

Ascocarps 100–208 μ diam, globose or slightly depressed, scattered singly or several grouped and walls connected by hyphae. Asci 60–90 × 11–16 μ, oblong, about 32-spored. Ascospores 9–13.5 × 3–4 μ, hyaline, obovate, rounded above and strongly tapered to pointed base; septum supramedian.

On cone scales of *Tsuga canadensis* (L.) Carr., eastern North America.

Material examined:

Quebec: *Barr 1871* (MASS). Maine: *Barr 3263, 3467* (Mass). New Hampshire: *Barr 3881* (MASS). Vermont: *Barr 4188* (MASS). Massachusetts: *Barr 2915, 3206, 4971* (MASS). New York: Knowersville, May, *C. H. Peck* (type of *Sphaerella conigena* Peck, 1885, NYS); Helderberg Mts., May, *C. H. Peck* (NY). West Virginia: Fayette Co., 16 Dec 1893, *L. W. Nuttall* (MICH).

Peck described two different species as *Sphaerella conigena.* The earlier name dates from 1880 and designates an eight-spored fungus on cones of *Thuja.* This species is transferred to *Scirrhia* in the present paper. Peck's second *S. conigena* has polysporous asci and occurs on cones of *Tsuga.* It is closely related to *D. strobiligena* on cones of *Pinus* spp. in southern Europe. The latter has larger ascocarps and elongate-ovate rather than obovate tapered ascospores. A third use of the name *Sphaerella conigena*, (Ellis and Everhart 1892) was for a fungus which appears to belong in *Massarina* in the Pleosporales.

Delphinella polyspora (Johans.) Müller in Müller & von Arx, Beitr. Kryptogamenfl. Schweiz 11(2): 27. 1962.

Müller (in Müller and von Arx 1962) provided synonymy for this species. It is subarctic in distribution, occurring on *Loiseleuria* and *Diapensia* in northern Europe and North America. I have described and illustrated this fungus (as *Mycosphaerella polyspora*) from several collections made in northeastern North America (Barr 1959). *D. polyspora* has smaller, more conic ascocarps than the other species of the genus.

Scirrhia Nits. in Fuckel, Symb. Mycol. 220. 1870, emend.

Ascocarps depressed globose, rounded, linear, or irregular, uni- or multiloculate, immersed, becoming erumpent, opening by an apical pore which is stuffed with small cells at first; wall composed of vertically oriented rows of brown or reddish brown cells forming *textura globosa* or *textura angularis,* between locules often as *textura prismatica;* outermost layers blackened, the inner cells brown to hyaline; brown hyphae penetrating host tissues. Asci oblong or clavate, tapered to a foot-like base, bitunicate, octosporous, nearly parallel from basal cells into tissue of locule which is compressed between and remains intact over apices of asci. Ascospores overlapping biseriate in the ascus, hyaline or yellowish, narrowly elliptic or obovate; septum nearly median, constricted or not, upper portion at times broader than lower, straight or often inequilateral; contents homogeneous or minutely guttulate; wall smooth.

Conidial states: *Hadrotrichum* Fuckel: conidiophores as short surface cells of erumpent stromata, sympodial; conidia produced singly and successively as blown out

ends of growing point, brown, globose, one-celled, wall thick and rough. *Dothistroma* Hulbary: conidiophores lining locules of elongate erumpent stromata, as end cells of vertically arranged hyphae composing base of locule; conidia hyaline, cylindric, several-septate, wall smooth. Microconidial state described as *Asteromellopsis* Hess & Müller. Illustrations of the conidial states may be found in Obrist (1959), Funk and Parker (1966), and Hess and Müller (1951), respectively.

Saprobic or parasitic on culms of monocotyledons, leaves and cone scales of gymnosperms, branches or stalks of woody dicotyledons; widespread in temperate or warm regions.

Müller and von Arx (1962) synonymized the genera *Scirrhodothis, Scirrhophragma,* and *Metameris* under *Scirrhia.* From my study of the type species of these genera, I believe that they all differ from *Scirrhia.* Theissen and Sydow (1915) erected *Scirrhodothis* for *Scirrhia confluens* Starb. [= *S. aspidiorum* (Lib.) Bubák] because they found paraphyses in the locule. Later (1918) they included the genus with *Scirrhia.* Petrak (1927, 1953) suggested that *S. aspidiorum* was similar to *Didymella.* Obrist (1959) considered that the fungus was a species of *Scirrhia* and described another species on fern petioles, *S. osmundicola.* It is my opinion that *S. aspidiorum* differs generically from *Scirrhia rimosa* and that the genus *Scirrhodothis* must be placed in the Pleosporales.

Scirrhophragma was based on *S. regalis* Theissen and Sydow (1915), a name which Obrist (1959) recognized was predated by *S. osmundae* (Peck & Clinton) Obrist. *Metameris japonica* Theissen and Sydow (1915) was described from *Osmunda regalis* var. *japonica.* Obrist tentatively considered it to be identical with *Scirrhophragma osmundae;* von Arx studied Japanese material as well as European and united all three under the earliest name as *Scirrhia osmundae* (Peck & Clinton) von Arx (in Müller & von Arx, 1962). This fungus, the type species of both *Scirrhophragma* and *Metameris,* is a member of the Pleosporales. The ascospores are unusual—two septa are normally formed and the middle cell is slightly enlarged. The middle and tapered lower cell have minutely guttulate contents, whereas the smaller upper cell is homogeneous and clear. I suggest that *Scirrhophragma osmundae* is closely related to the genus *Paraphaeosphaeria* O. Eriksson.

Further complicating the delimitation of *Scirrhodothis* and *Scirrhophragma* are two other genera which are superficially similar in producing elongate stromata. *Rhopographus* Fuckel with type *R. filicinus* (Fr.) Fuckel seems to be most closely related to *Leptosphaeria,* as Müller and von Arx (1950) suggested, and is a member of the Pleosporales. The second genus which may be confused is *Dangeardiella* Saccardo and Sydow, with *D. macrospora* (Schroet.) Sacc. & Syd. the type species. This fungus forms elongate ascocarps which open at maturity by a narrow compressed slit. The elongate slit and structure of the locule indicate that *Dangeardiella* is a member of the Lophiostomataceae as Obrist (1959) has observed.

The genus *Mycosphaerellopsis* von Höhnel (1918), typified by *M. myricariae* (Fuckel) von Höhnel, seemed possible to accommodate the species with uniloculate ascocarps according to the brief generic diagnosis. Von Höhnel indicated that *Mycosphaerellopsis* belonged in the Pseudosphaeriaceae, and that it was similar to *Mycosphaerella* except that a mass of stromatic tissue remained between the asci. Examination of European material of the type species [*Sydow, Mycotheca germ. 1169, Sphaerella myricariae* (Fuckel) Sacc., BPI], convinced me that Petrak's (1923) disposition of the fungus under *Didmyella* and his reduction of *Mycosphaerellopsis* to synonymy with *Didymella* was the best solution. The tissue remaining between and above the asci is elongate cellular, i.e. pseudoparaphysate. A conidial fungus intimately associated with ascocarps on the same leaves is referrable to *Ascochyta.* Several species of this genus have been connected by cultural studies with species of *Didymella.* Von Arx (1949) placed *Mycosphaerellopsis* in synonymy with *Mycosphaerella,* but did not

provide details of the type species. Müller and von Arx (1962) later considered *Mycosphaerellopsis* a synonym of *Didmyella* and cited Petrak's (1923) discussion of the genus.

The concept of *Scirrhia* is here broadened to include species previously described as *Dothidea,* in which the ascospores are hyaline or light colored, usually narrowly elliptic and tapered to the pointed base, and whose contents are minutely granulate or guttulate. *Scirrhia* as emended includes taxa which may have uni- or multiloculate ascocarps. The asci in the locules are nearly parallel from the base, but may be so crowded at maturity that their arrangement is not clearly parallel.

Type species: *S. rimosa* (Alb. & Schw. ex Fr.) Nits. in Fuckel.

Scirrhia rimosa (Alb. & Schw. ex Fr.) Nits. in Fuckel, Symb. Mycol. 221. 1870. Figures 47–49.

≡ *Sphaeria rimosa* Alb. & Schw. ex Fr. Syst. Mycol. 2: 427. 1823.
≡ *Dothidea rimosa* (Alb. & Schw. ex Fr.) Fr. Summa Veget. Scand. 368. 1849.
≡ *Phoma rimosa* (Alb. & Schw. ex Fr.) West. Bull. Acad. Roy. Sci. Belgique 19(3): 116. 1852.
= *Dothidea rimosa β depauperata* Desm. in Rabenh. Fungi Europ. n. 349. 1859.
≡ *Scirrhia depauperata* (Desm.) Fuckel, Symb. Mycol. 221. 1870.

Ascocarps multiloculate, linear or elliptic, 0.5–8 cm long, 1–3 mm wide, 330–385 μ deep; locules 110–220 μ diam. Asci 60–75 × 14–17 μ. Ascospores constricted at the median septum, 15.5–24 × 5–6 μ, hyaline, obovate, the ends obtuse or pointed.

Conidial state: *Hadrotrichum phragmites* Fuckel: conidiophores as short surface cells of elongate stromata; conidia 12–16 μ diam, globose, brown, one-celled. Obrist (1959) illustrated this state and described *Acremonium*-like conidia which were produced in culture. The conidia were abstricted from ends of short side branches of hyphae and were hyaline, globose or ovoid.

On *Phragmites communis* Trin., Europe, Asia, North Africa.

Obrist (1959) and Müller and von Arx (1962) included North America in the range of this fungus but I have not seen any North American specimens. The description is drawn from data obtained from extralimital collections.

Additional species:

Scirrhia insculpta (Wallr.) Barr, comb. nov.

≡ *Dothidea insculpta* Wallr. Fl. Cryptog. German. 2: 864. 1833.
≡ *Plowrightia insculpta* (Wallr.) Sacc. Syll. Fungorum 2: 636. 1883.
≡ *Dothidella insculpta* (Wallr.) Theiss. & Syd. Ann. Mycol. 13: 310. 1915.
≡ *Systremma insculpta* (Wallr.) Hess & Müller, Ber. Schweiz. Bot. Ges. 61: 7. 1951.

Ascocarps multiloculate, rounded or elongate, 420–660 μ diam, or up to 1–1.5 mm long, the locules 78–104 μ diam. Asci 70–90 × 12–15 μ. Ascospores 18–22.5 × 5.5–6.5 μ, hyaline or yellowish or light brown, elliptic, constricted at the nearly median septum, the ends tapered to obtuse tips.

On *Clematis ligusticifolia* Nutt., *Clematis* spp., Europe, North America.

Material examined:

Montana: *Ell. & Ev. N.A.F. 2129* (as *Parodiella fruticola*); Sand Coulee, 11 Feb 1888, *Anderson* (NY). Colorado: *Ell. & Ev. Fungi Columbiani 718* (as *Otthia fruticola*); Fort Collins, 21 Mar 1896, *Baker* (NY).

Hess and Müller (1951) described the microconidial state of *S. insculpta* as *Asteromellopsis insculpta* Hess & Müller. The conidia were 1.5–2 × 1 μ, hyaline, rod-shaped, one-celled, formed from spore mother cells lining locules in the stroma. In addition to the microconidial state, macroconidia were formed occasionally in intensively dividing cells at the surface of the stroma. In describing development of *S.*

insculpta, Hess and Müller found that ascogenous hyphae in the stroma could be dicaryotized in one of several ways. Asci produced from dicaryotic hyphae developed into and compressed locule tissue as they enlarged.

In North America *S. insculpta* has been confused with *Parodiella fruticola* (Ellis & Everhart 1892). Both species inhabit stems of *Clematis ligusticifolia* in the western United States and the two often occur together. The shining black ascocarps of *S. insculpta* are usually larger and more erumpent than the dull black ascocarps of *P. fruticola.* Under the microscope the two species are readily distinguished. Numerous small locules occupy the upper portion of the ascocarp of *S. insculpta,* each containing a group of asci whose ascospores are only slightly pigmented. The ascocarps of *P. fruticola* contain a single large locule, the base is usually thickened and sterile and composed of large cells, while externally coarse brown hyphae form a basal tomentum. Within the locule, numerous asci develop among pseudoparaphyses and contain one-septate yellowish brown ascospores, 26–35(–39) × 10–15 μ. *P. fruticola* appears to be most closely related to species of *Herpotrichia* sens. str. in the Pleosporales.

Scirrhia concaviuscula (Ell. & Ev.) Barr, comb. nov.

≡ *Dothidea concaviuscula* Ell. & Ev. North Amer. Pyrenomyc. 612. 1892.
≡ *Plowrightia concaviuscula* (Ell. & Ev.) Sacc. Syll. Fungorum 11: 376. 1895.
≡ *Dothidella concaviuscula* (Ell. & Ev.) Theiss. & Syd. Ann. Mycol. 13: 312. 1915.

Ascocarps multiloculate, circular, elliptic, or irregular, 0.5–1 mm diam, 220–385 μ high, erumpent, the surface dull black, plane or depressed; locules numerous, 78–117 μ diam. Asci 36–54 × 10–13 μ Ascospores not or slightly constricted at median septum, 16–20 × 4–4.5 μ, hyaline, elliptic, the ends obtuse.

On dead branches of *Magnolia virginiana* L., eastern North America.

Material examined:

Ontario: *Fungi Columbiani 1925.* New Jersey: Newfield, March 1876, *Ellis* (as *Dothidea excavata*), 17 Feb 1879 (as *Curreya excavata*), March 1897 (all NY).

The description of *Dothidea concaviuscula* agrees well with my findings for the two earlier New Jersey collections but the other two specimens cited are immature. Ellis and Everhart described their species "on dead branches of *Magnolia glauca,* Newfield, N.J." The 1876 collections bears a few notes by Ellis and apparently is the type specimen of *Scirrhia concaviuscula.*

Scirrhia conigena (Peck) Barr, comb. nov. Figure 53.

≡ *Sphaerella conigena* Peck, Annual Rep. New York State Mus. 33: 34. 1880, *non* Peck 1885, nec Ell. & Ev. 1890.
≡ *Mycosphaerella conigena* (Peck) House, Bull. New York State Mus. 233–234: 126. 1921.
= *Sphaerella conicola* Peck in Sacc. Syll. Fungorum Addit. 1–4: 75. 1886.
= *Sphaerella canadensis* Ell. & Ev. North Amer. Pyrenomyc. 280. 1892.
= *Mycosphaerella thujae* Petrak, Ann. Mycol. 20: 179. 1922.

Ascocarps usually uniloculate, 120–180(–220) μ diam, slightly depressed, the apex short conic at times, immersed or erumpent; wall 15–25 μ thick, the cells blackish brown externally, hyaline toward interior; apical pore 30 μ wide. Asci 45–68(–80) × (12–)18–20 μ. Ascospores (11–)15–31.5 × (3.5–)5–7 μ, hyaline or yellowish, narrowly obovate, straight to inequilateral, not constricted at the median septum.

On leaves and cone scales of *Thuja* spp., North America.

Material examined:

Massachusetts: *Barr 1871* (MASS). New York: Helderberg Mts., July, *C. H. Peck* (type of *S. conigena,* NYS, NY). Idaho: Priest River, 12 May 1920, *Weir & Rhoads* (type of *M. thujae,* BPI). Washington: Ione, 6 July 1929, *Hedgcock* (BPI). California: *Calif. Fungi 485* (as *M. canadensis,* MICH, NY).

The duplication of the name "*Sphaerella conigena*" already was discussed under *Delphinella tsugae. Scirrhia conigena* has a wide range of ascospore sizes in the collections examined. Peck's type specimen from cones has ascospores 25–31.5 × 6.5–7 μ. I have been unable to locate authentic material of *Sphaerella canadensis,* but the original description (Ellis and Everhart 1892) gave ascospore sizes as 20–22 × 5–7μ. The California specimens identified as *S. canadensis* have ascospores 17–30.5 × 4–6.5 μ. In the type material of *M. thujae* the ascospores measured 11–15 × 4–5 μ; Petrak (1955) suggested that his species was immature material of *S. canadensis.* Shape and contents of ascospores are quite consistent throughout the collections, as are structure and aspect of ascocarps, locules, and asci.

Scirrhia pini Funk & Parker, Canad. J. Bot. 44: 1171. 1966.

Funk and Parker (1966) provided a detailed description and illustrations of *S. pini.* The conidial state is *Dothistroma pini* Hulbary, which has been recorded from North America, Europe, and Africa on numerous species of *Pinus.* The perfect state was described from *P. contorta* in British Columbia.

Funk and Parker compared this species with *Scirrhia acicola* (Dearn.) Siggers and noted generic differences between the two fungi, particularly in the asci and locule. According to comparative studies of both fungi and of the literature (Siggers 1939, Wolf & Barbour 1941), the locules of *S. acicola* are dothideaceous. For additional discussion of the fungus, see *Mycosphaerella dearnessii.*

Scirrhia crustosa Barr, sp. nov. Figures 50–52.

Ascocarpia 100–110 μ diametro, 70–100 μ alta, globoso-depressa, immersa vel erumpentia, hyphis brunneis consociatis. Asci 27.5–48.5 × 9–11 μ, oblongi, bitunicati. Ascosporae 9–12 × 2.5–3.5 μ, hyalinae, obovatae, uniseptatae.

Specimen typicum in ramulis emortuis *Spiraeae lucidae,* prope "north of Junction between highway and Trail 246, Bonner Co., Idaho, 8 June 1940," legit A. W. Slipp 679; in herb. Univ. Mass. depositum.

Ascocarps uniloculate, 100–110 μ diam, 70–100 μ high, depressed globose, immersed then erumpent; wall composed of two to four layers of polygonal cells; brown hyphae forming a thin dark crust one to two cell layers thick connecting groups of ascocarps. Asci 27.5–48.5 × 9–11 μ, oblong. Ascospores 9–12 × 2.5–3.5 μ, hyaline, obovate, straight or inequilateral, not constricted at the median septum.

On dead branches of *Spiraea lucida* Dougl., western North America.

Material examined:

Idaho: *Slipp 679* (type, MASS).

The thin crust connecting groups of ascocarps provides the main distinguishing characteristic of this small species.

Coccoidella v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. Abt. 1, 118: 847. 1909.

= *Eumicrocyclus* Hara, Bot. Mag. (Tokyo) 29: 52. 1915.

Ascocarps multiloculate, the superficial portion peltate, borne on a central foot-like hypostroma in leaf tissues; locules in a single layer in the stroma, globose or ovoid, opening by a small apical pore; walls of vertically oriented rows of thick walled, brown cells forming *textura angularis,* cells toward base of hypostroma forming *textura prismatica.* Asci oblong or saccate, bitunicate, octosporous. Ascospores overlapping biseriate or crowded in the ascus, hyaline to yellowish, finally dull brown, oblong or obovate; septum median; contents minutely guttulate.

Conidial state not known.

Parasitic on living leaves of *Magnolia* and *Persea* spp., southern United States.

Although Müller and von Arx (1962) assigned *Coccoidella* to the Venturiaceae, I am unable to concur. The locules of the type species are dothideaceous. The immersed hypostroma and superficial multiloculate ascocarps are somewhat reminiscent of those of *Rhizogene.* However, wall structure, locule cells which persist for a long time, and ascospore shape and contents all suggest a position within the Dothioraceae rather than the Dothideaceae.

Type species: *C. scutula* (Berk. & Curt.) v.Höhnel.

Coccoidella scutula (Berk. & Curt.) v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. 1, 118: 847. 1909. Figures 54–56.

≡ *Dothidea scutula* Berk. & Curt. North Amer. Fungi n. 889. 1859.
≡ *Dothidella scutula* (Berk. & Curt.) Sacc. Syll. Fungorum 2: 632. 1883.
≡ *Polystomella scutula* (Berk. & Curt.) Speg. Bol. Acad. Nac. Ci. 11: 381. 1889.
≡ *Microcyclus scutula* (Berk. & Curt.) Sacc. Ann. Mycol. 2: 165. 1904.
≡ *Eumicrocyclus scutula* (Berk. & Curt.) Hara, Bot. Mag. (Tokyo) 29: 52. 1915.
≡ *Coccoidea scutula* (Berk. & Curt.) Hara, Bot. Mag. (Tokyo) 29: 53. 1915.

Ascocarps 0.5–1.5 mm diam, 150–200 μ high; locules 60–90 μ diam, 80–100 μ high. Asci (40–)50–65 × 13–15.5 μ. Ascospores 15.5–21 × 5–6.5 μ, straight or inequilateral.

Usually epiphyllous on living leaves of *Magnolia* sp., *Persea borbonia* (L.) Spreng., southern United States.

Material examined:

South Carolina: *Ravenel, Fungi Am. exs. 371a, 478; Ellis N.A.F. 684.* Georgia: *Ravenel, Fungi Am. exs. 385.* Florida: *Fungi Columbiani 240, Rabenh.-Winter Fungi eur. 3559, Rehm Ascom. 1673* (with *Asterina pelliculosa*), 1669; *E. West 10224* (NY). Mississippi: Ocean Springs, 30 Mar 1889, *F. S. Earle* (NY); *S.M. Tracy 1075, 4048* (NY). Texas: Galveston, 1869, *H. W. Ravenel* (NY).

Sydowia Bres. Hedwigia 34: Beibl. 66. 1895.

= *Plowrightia* subgenus *Plowrightiella* Sacc. Syll. Fungorum 11: 376. 1895.
≡ *Plowrightiella* (Sacc.) Sacc. Syll. Fungorum 24: 543. 1926.
= *Pleodothis* Clements, Gen. Fungi 49, 173. 1909.
= *Keisslerina* Petrak, Ann. Mycol. 17: 74. 1919.
= *Jaapia* Kirschst. Kryptogamenfl. Mark Brandenburg 7(3): 444. 1938, *non* Bres. 1911.

Ascocarps usually uniloculate, depressed globose or conic, immersed becoming erumpent, the apex rounded or short papillate, opening widely at maturity; wall thick, several layers of cells forming *textura angularis* or approaching *textura prismatica,* darkened externally; hyaline or yellowish small cells forming a broad basal layer and occupying locule and pore area in immature ascocarps, the cells often in vertically oriented rows. Asci oblong or clavate, bitunicate, polysporous, arising in a layer or in a fascicle in small locules. Ascospores crowded and overlapping in the ascus, hyaline or becoming dull brown, obovate or elliptic, several-septate, constricted at the primary septum; vertical septum in mid cells when present, rarely in end cell; upper portion of ascospore broader and usually shorter than lower, straight to inequilateral; contents minutely guttulate; wall smooth.

Conidial state: *Dothichiza:* pycnidia pulvinate, globose or irregular, large; wall thick, dark; conidia produced from undifferentiated cells of inner wall, hyaline or brownish, elliptic or fusoid, one-celled (illustrated by von Arx, 1970). Also *Sclerophoma* (see *Sydowia polyspora*).

Parasitic or saprobic on leaves and branches of gymnosperms, branches of woody dicotyledons, temperate Europe, North America.

Plowrightia subgenus *Plowrightiella* was published for *Dothidea polyspora* the same year that *Sydowia* was erected. Müller (1953b) established that the names *D. polyspora* and *Sydowia gregaria* referred to the same species. Müller also noted that *Pleodothis*

was a superfluous name under the Code. *Keisslerina* was based on *K. moravica* Petrak on *Euonymus,* and was said to differ from *Dothiora* by thickly grouped, non-erumpent ascocarps and asci with 16(–24) spores. *Jaapia* was typified by *J. triglitziensis* Kirschst., also on *Euonymus.* Both Kirschstein (1938) and Petrak (1940) agreed that *Jaapia* was identical with *Keisslerina.* According to descriptions there is no generic difference between *Keisslerina, Jaapia,* and *Sydowia.*

Endodothiora Petrak (1929) with *E. sydowiana* has thin-walled ascocarps immersed in stromata of *Systremma puccinioides* (i.e. *Dothidea puccinioides*). The asci are polysporous and the ascospores hyaline with several transverse and occasional vertical septa. Perhaps the immersed parasitic habit is sufficient to separate *Endodothiora* from *Sydowia.*

Both sizes and shapes of ascospores within the genus *Sydowia* tend to be uniform. The species are distinguished chiefly on aspect of the ascocarps and the number of ascospores per ascus.

Type species: *S. polyspora* (Bref. & v.Tavel) Müller.

Sydowia polyspora (Bref. & v.Tavel) Müller, Sydowia 7: 342. 1953. Figures 57–58.

≡ *Dothidea polyspora* Bref. & v.Travel, Untersuch. Gesamtgeb. Mykol. 10: 296. 1891.
≡ *Plowrightia polyspora* (Bref. & v.Tavel) Sacc. Syll. Fungorum 11: 376. 1895.
≡ *Pleodothis polyspora* (Bref. & v.Tavel) Clements, Gen. Fungi, 49, 173. 1909.
≡ *Hariotia polyspora* (Bref. & v.Tavel) v.Höhnel, Ann. Mycol. 16: 168. 1918.
= *Sydowia gregaria* Bres. Hedwigia 34: Beibl. 66. 1895.
= *Dothiora pinacea* Vel. Monog. Discomyc. Bohem. 47. 1934.

Ascocarps 240–330 μ diam, 220–275 μ high, depressed globose, scattered or grouped and confluent at times, the apex rounded-plane; wall 40–80 μ thick. Asci 70–85 × 12–15 μ, 24–32-spored. Ascospores (9–)12–20(–28) × 3–5(–8.5) μ, hyaline, obovate, broadest above and narrowed to a pointed base, (1–2–)3(–6)-septate, occasionally with vertical septum in one to three cells.

Conidial states: *Sclerophoma magnusiana* Wilson & Hahn. *Dothichiza pityophila* (Corda) Petrak.

Saprobic or parasitic on branches and leaves of various gymnosperms: *Abies, Larix, Picea, Pinus, Pseudotsuga, Thuja,* and *Tsuga* spp., Europe and North America.

Material examined:

Quebec: Saint-Malachie, 26 May 1964, *Smerlis & Saint-Laurent* (NY). British Columbia: *DAOM 88497, 111294* (DAOM).

Müller (1963b) provided most of the synonymy cited above. Butin (1964) successfully demonstrated cultural connections between *Sydowia polyspora* and *Dothichiza pityophila.* He provided descriptions and synonymy of both states of the fungus. More recently, Smerlis (1970a) established the connection between *S. polyspora* and *Sclerophoma magnusiana.* He also established the pathogenicity of the fungus with respect to a number of gymnosperms, noting that cankers were produced on *Abies balsamea* from artificial inoculation and that *Sclerophoma* was reisolated the following spring from these cankers.

Additional species:

Sydowia dothideoides Dearn. & Barth. Mycologia 18: 248. 1926.

= *Dothiora polyspora* Shear & Davidson, Mycologia 32: 105. 1940.

Ascocarps 330–715 μ diam, or larger by confluence, 275–385 μ high, pulvinate rounded, thickly scattered and seated in hyphal subiculum, the apex plane or somewhat depressed; wall 40–90 μ thick, up to 130 μ at base; ascocarp at times two-locular. Asci 90–120 × 18–20 μ, 24–32-spored. Ascospores (13–)16–18(–24) × (4–)5–8 μ, hyaline, obovate, broadest above and tapered to the pointed or obtuse

base, 3 (–4–6)-septate, constricted at the primary septum, with vertical septum in one or more of mid cells, rarely into one end cell.

Conidial state: *Dothichiza:* pycnidia on sterilized and inoculated *Salix* twigs erumpent in hyphal subiculum; conidia 8–9 × 4–5 μ, hyaline, oblong, one-celled. On naturally infected *Salix* twigs pycnidia thickly scattered, 250 μ diam, 165 μ high, immersed in hyphal subiculum; conidia 6.5–13 × 3–4 μ, hyaline, oblong, one-celled.

On thin branches and twigs of *Populus tremuloides* Michx., pycnidia or immature ascocarps on *Salix* sp., western North America.

Material examined:

Wyoming: Jenny Lake, 14 July 1924, *Bartholomew 8792,* 2 packets (type of *S. dothideoides, Dearness Herb. 5710,* in DAOM). Colorado: Mesa Lake, Grand Mesa, 1 June 1938, *Davidson 4222,* 2 packets (type and isotype of *D. polyspora,* BPI). immature on *Salix,* same locality, 17 June 1930, 2 packets, 1 June 1938 (BPI); on sterilized *Salix* twig, *Dothichiza* from ascospore cultures (BPI).

The copious subiculum beneath thickly grouped ascocarps characterizes this species. Smerlis (1970a) noted similarity in morphological characteristics between *S. dothideoides* and *Dothiora polyspora,* and suggested that these were possibly synonymous entities.

Sydowia pruni Barr, sp. nov. Figure 61.

Ascocarpia 385–660 μ diametro, 275–440 μ alta, pulvinata, erumpentia singulatim vel in catervis ellipticis vel in seriebus elongatis, peridio 78–104(–195) μ crasso. Asci 104–140 × 15–23.5 μ, oblongi, bitunicati, polyspori. Ascosporae 13–18 × 5–6 μ, hyalinae, obovatae, 3 (–4–5)-septatae et septo verticali instructae.

Specimen typicum in ramulis emortuis *Pruni demissae,* prope "Marble, Washington, 30 July 1935," legit *G. G. Hedgcock,* in herb. National Fungus Collections depositum.

Ascocarps 385–660 μ diam, 275–440 μ high, pulvinate, erumpent singly or in small elliptic groups or elongate rows; wall 78–104(–195) μ thick, the cells sclerotial. Asci 104–140 × 15–23.5 μ, more than 32-spored (up to 42 counted). Ascospores 13–18 × 5–6 μ, hyaline, obovate, straight, inequilateral or somewhat bent, broadest above and tapered to a pointed base, 3 (–4–5)-septate, constricted at the primary septum, with vertical septum in one or both mid cells and often in upper end cell.

On branches of *Prunus demissa* (Nutt.) D. Dietr., *P. melanocarpa* Nels., western North America.

Material examined:

Washington: Marble, 10 June 1935, *For. Path. 66556,* 29 July 1935, *For. Path. 68377,* 30 July 1935, *For. Path. 68385* (type) (all BPI, identified by Dearness as *S. dothideoides* var. *pruni-demissae* Dearn. ined.). Wyoming: Jenny Lake, 11 July 1924, *Bartholomew 8782a* (as *S. melanocarpa* Dearn. ined., *Dearness Herb. 5710,* in DAOM).

The absence of a copious subiculum and the formation of more than 32 ascospores per ascus sufficiently separates *S. pruni* from *S. dothideoides.*

Sydowia lepargyrea Dearn. ex Barr, sp. nov.

Ascocarpia 330–440 μ diametro, 275–330 μ alta, pulvinata, erumpentia singulatim vel aliquot consociata, peridio latere 52–65 μ crasso, fundusque ad 104 μ. Asci 90–104 × 15.5–20 μ, oblongi, bitunicati, polyspori. Ascosporae 14–18(–22) × 3.5–5 μ, hyalinae, obovatae, (1–)3 (–4–7)-septatae et septo verticali instructae.

Specimen typicum in ramulis emortuis *Shepherdiae canadensis,* prope "east of Aladdin, Washington, 15 May 1931," legit *G. G. Hedgcock*; in herb. Dearness in DAOM depositum.

Ascocarps 330–440 μ diam, 275–330 μ high, pulvinate, dull black, scattered or two or three connected, erumpent, the apex plane; wall 52–65 μ thick at sides, up to 104 μ thick below. Asci 90–104 × 15.5–20 μ, more than 32-spored. Ascospores 14–18(–22) × 3.5–5 μ, hyaline, obovate, broadest above and tapered to the pointed base, (1–)3 (–4–7)-septate, with vertical septum in one or more of mid cells.

On dead twigs of *Shepherdia canadensis* (L.) Nutt., western North America.

Material examined:

Washington: east of Aladdin, 15 May 1931, *Hedgcock* (type, as *S. lepargyrea* Dearn. n.sp., *Dearness Herb. 8224,* in DAOM); Ione, 11 July 1935, *Hedgcock* (Dearness Herb. in DAOM).

Sydowia lepargyrea seems closely related to *S. pruni,* differing especially in smaller less crowded ascocarps and narrower ascospores. Immature ascocarps of *S. lepargyrea* contain a small rounded locule crowded with asci; in more mature ascocarps the asci occupy a large broad area and are definitely parallel.

Sydowia versiformis Barr, sp. nov. Figures 59–60.

Ascocarpia 440–660 μ diametro, 330–440 μ alta, pulvinata, rotunda vel elliptica, erumpentia singulatim, peridio latere 60–80 μ crasso, fundusque ad 180 μ. Asci 120–140 × 20–26 μ, oblongi, bitunicati, polyspori. Ascosporae 8–10 × 3.5–4.5 μ et 0–1-septatae aut 17–25 × 6–9 μ et 3–5-septatae, hyalinae vel fuscae, ellipticae vel obovatae, septo verticali instructae.

Specimen typicum in ramulis emortuis *Sorbi sitchensis,* prope "Mt. Revelstoke, British Columbia, 23 July 1963," legit *R. A. Shoemaker,* sub DAOM *105213,* in herb. DAOM depositum.

Ascocarps 440–660 μ diam, 330–440 μ high, pulvinate, elliptic or rounded from above, thickly scattered, erumpent separately; locule single, composed of vertically oriented rows of cells, blackened externally, hyaline within; wall at maturity 60–80 μ thick at sides and upper surface, up to 180 μ deep at base. Asci 120–140 × 20–26 μ, broadly oblong, parallel, polysporous, the ascospores closely packed and difficult to count. Ascospores 8–10 × 3.5–4.5 μ and 1-celled or 1-septate, 17–25 × 6–9 μ and 3–5-septate, hyaline to brown, elliptic or obovate, often broadest above and tapered to the pointed base, constricted at the primary septum or often at all septa, with vertical septum in one or more mid cells.

On dead branches of *Sorbus sitchensis* Roem., *S. occidentalis* (Wats.) Greene, western North America.

Material examined:

British Columbia: *DAOM 105213* (type, DAOM); *Barr 668a* (MASS).

The ascospores in this species are extremely variable in size, shape, and septation. Within one ascus all variations may occur and these ascospores are difficult to separate from one another for counting or measuring. There appear to be more than 32 ascospores produced in an ascus.

Shoemaker (pers. comm.) noted that the ascospores of *S. versiformis* budded in the ascus, but no octosporous asci were found in the specimens examined. For this reason the species was compared closely with *Dothiora pyrenophora* on the same host genus. Ascocarps are similar in aspect and structure and are slightly smaller in *S. versiformis*; asci in the latter species are approximately twice the size of those in *D. pyrenophora*; the largest ascospores of *S. versiformis* are within the size range for ascospores of *D. pyrenophora,* and in the two species the ascospores are similar in shape and variable in septation. The major difference noted by comparison was in ascus sizes, while all other characteristics seem to be within the range of variability of species in the Dothioraceae. With the present evidence I must consider the two entities as distinct species.

Associated with *S. versiformis* in both collections cited is a Pleosporaceous fungus with larger muriform ascospores. A number of sections contained overmature ascocarps of the *Sydowia* and young or mature ascocarps of the other fungus in close proximity. Wall structure distinguishes the two species if asci and ascospores are not present. The Pleosporaceous fungus which seems to be a variant of *Cucurbitaria sorbi* Karsten has thinner side walls, but the basal wall may be thickened. Wall cells are not arranged in

vertical rows as they are in *S. versiformis. C. sorbi* is associated with *Dothiora pyrenophora* in several European collections which I have examined.

Dothiora Fr. Flora Scanica 347. 1835–37 (name only); Summa Veget. Scand. 418. 1849.

= *Plowrightia* Sacc. Syll. Fungorum 2: 635. 1883.
= *Dothiora* subgenus *Metadothis* Sacc. Syll. Fungorum 8: 764. 1889.
= *Leptodothiora* v.Höhnel, Ann. Mycol. 18: 78. 1920.

Ascocarps uni- or multiloculate, pulvinate to depressed globose, immersed becoming erumpent; apex plane, broadly rounded, or short and blunt papillate, opening by small or irregular pore area; ascocarps scattered or grouped, at times in long rows, as locules, either rounded or ring-like, in small stroma at times; wall thick, several layers of large cells forming *textura angularis,* often oriented vertically in rows, blackened externally, hyaline or light brown inner layers of small polygonal or somewhat compressed cells forming a broad basal cushion and locule wall, filling locule and stuffing pore area before asci develop. Asci oblong or short clavate, arising from base in parallel group, bitunicate, octosporous, dissolving locule tissue. Ascospores hyaline or occasionally yellowish or light dull brown, obovate or elliptic, often inequilateral or slightly curved or bent, (one–)several-septate, the primary septum nearly median and usually constricted; vertical septum in one or several mid cells, rarely in an end cell, not formed in some species; contents homogeneous or minutely guttulate; wall smooth, occasionally surrounded by a thin gelatinous coating.

Conidial state: *Dothichiza* Lib. (see p. 568 under *Sydowia*).

Saprobic in leaves, branches and cone scales of gymnosperms, branches of woody dicotyledons, widespread in temperate regions.

The presence or absence of a vertical septum in the ascospores is an extremely variable characteristic in this genus. Consistent similarities exist in ascocarp structure, locule formation, and ascospore shape. When the species are arranged in a sequence based on length of ascospores, the smallest had no vertical septa, the largest consistently had vertical septa, and intermediate species occasionally had vertical septa. Thus *Dothiora* subgenus *Metadothis* and *Leptodothiora,* both erected for phragmosporous species, are united with *Dothiora.* The type species of *Plowrightia, P. ribesia,* agrees in all respects with my concept of *Dothiora.* Removal of this and other species from *Dothidea* results in a more natural grouping both in *Dothidea* and in the other genera concerned.

Clements and Shear (1931) placed *Protoscypha* Sydow in the synonymy of *Dothiora.* Miller and Burton (1943) merged *Pittierodothis* Chardon with *Dothiora. Pittierodothis* is identical with *Protoscypha* and closely related to *Annajenkinsia,* according to von Arx (1963). These genera appear to belong in the Arthoniaceae.

The species of *Dothiora* may be grouped in three series based on ascospore shape and septation. *D. pyrenophora* and *D. thujae* have obovate ascospores with broadly rounded ends; both transverse and vertical septa are formed. Reduction of ascocarp size in *D. thujae* from *D. pyrenophora* points the way to *Saccothecium*. In the second group of species the ascospores are more narrowly obovate and taper to the pointed base and have both transverse and vertical septa. The third group of species has narrowly elliptic or obovate ascospores, usually pointed at the ends, and transverse septa only.

1. Series of *D. pyrenophora*:
Type species: *D. pyrenophora* (Fr.) Fr.

Dothiora pyrenophora (Fr.) Fr. Summa Veget. Scand. 418. 1849. Figures 62–64.

≡ *Dothidea pyrenophora* Fr. Syst. Mycol. 2: 552. 1823.

= *Hysterium sorbi* Wahl. ex Fr. *non Sphaeria sorbi* Wahl. ex Fr. *nec Sphaeria sorbi* Schmidt ex Fr.
≡ *Dothiora sorbi* (Wahl. ex Fr.) Fr. Summa Veget. Scand. 418. 1849; Fuckel, Symb. Mycol. 273. 1870.

Ascocarps 550–1000 μ diam, 275–495 μ high, rounded or elliptic or pulvinate, immersed becoming erumpent, the surface plane or slightly depressed, dull black; ascocarps composed of vertically oriented rows of cells forming *textura angularis*, blackened externally, brownish or pallid toward interior, brown hyphae penetrating host tissues; locule marginal as a ring, in median section appearing as two locules with sterile central portion or in some specimens the locule occupying the central portion also, 220–330 μ wide, 137–165 μ high. Asci 60–75 × 10–15 μ, from a low basal cushion of cells or at times an arched cushion, rarely fewer than 8 ascospores maturing. Ascospores (14–)22–35 × 6–9 μ, hyaline, occasionally light dull brown, obovate (the ends obtusely rounded), 3–8-septate, with vertical septum through mid cells, rarely into one end cell.

Conidial state: *Dothichiza sorbi* Lib.

On branches of *Sorbus* spp., Europe, North America.

Material examined:

Ontario: Field P.O., North Bay District, 13 July 1959, *D. Griffith & L. S. MacLead* (NY); *DAOM 91685* (DAOM). British Columbia: *DAOM 111288* (DAOM).

Additional species:

Dothiora thujae (Grove) Barr, comb. nov. Figure 72.

≡ *Pleospora thujae* Grove, J. Bot. 50: 49. 1912.

Ascocarps 130–245 μ diam, nearly globose, single or few grouped together and connected by hyphae; wall 20–50 μ thick, thickest at base; apex rounded papillate. Asci 37.5–63 × 18–27 μ, broadly oblong. Ascospores 20–30 × 6–9 μ, yellowish brown, obovate, with ends obtuse, straight to inequilateral, (3–)5 (–7)-septate, constricted at the primary and less at the secondary septa, with vertical septum (rarely two) in mid cells, occasionally extending into the apical cell; thin gelatinous coating 1.5–2 μ thick at times surrounding ascospores.

On cone scales of *Thuja occidentalis* L., Europe, North America.

Material examined:

Maine: *Barr 3232.* Quebec: *Barr 2019* (MASS).

The North American collections are in close agreement with Grove's description from English material. Wehmeyer (1961) did not examine this species, but suggested that it appeared from the description to be near *Pleospora phaeocomoides.*

2. Series of *D. rimincola*:

Dothiora rimincola (Schw.) Barr, comb. nov.

≡ *Hysterium rimincola* Schw. Trans. Amer. Philos. Soc. II. 4: 244. 1832.
≡ *Dothidea rimincola* (Schw.) Peck, Annual Rep. New York State Mus. 30: 64. 1878.

Ascocarps 500–1500 μ long or longer by confluence, 385–440 μ wide, 220–270 μ high, elongate or elliptic, erumpent in long rows; wall thick, externally dark brown and 26–39 μ thick, interior layers yellowish or hyaline and 26–35 μ thick, the basal hyaline region forming a raised cushion 52–78 μ deep in mid portion of locule; apex plane or slightly depressed from sides, surface pulverulent dull blackish. Asci 50–70 × 12–15 μ, oblong clavate. Ascospores inequilateral, 17–25 × 4–5 μ, hyaline, obovate, tapered to an obtuse or pointed base, the upper portion broader than the lower, (1–3–)5–7-septate, constricted at supramedian primary septum, with vertical septum in one or more mid cells.

On dead branches of *Diervilla lonicera* Mill., eastern North America.

Material examined:

New York: Buffalo, May, *G. W. Clinton* (NYS). Pennsylvania: Bethlehem, ex Herb. *Schweinitz* (isotype, NYS).

Peck transferred this species from *Hysterium* to *Dothidea* and noted that no linear slit was evident in the ascocarps. Apparently ascospore discharge is effected by breakdown of the entire upper wall. A single elongate locule is present, and the raised basal tissue is suggestive of that found in many specimens of *Dothiora pyrenophora,* and more pronounced in *Saccothecium.* The ascospores are typical in shape and septation of the second series of species in *Dothiora.* From the other species of the genus *D. rimincola* differs by the greatly elongate ascocarps.

Dothiora staphylina (Peck) Barr, comb. nov.

≡ *Sphaeria staphylina* Peck, Bull. Buffalo Soc. Nat. Sci. 1: 72. 1873; Annual Rep. New York State Mus. 26: 86–87. 1874.

≡ *Metasphaeria staphylina* (Peck) Sacc. Syll. Fungorum 2: 167. 1883.

Ascocarps 208–440 μ diam, 117–220 μ high, uni- or multi-loculate; wall 26 μ thick at sides, up to 90 μ at lower sides at times; apex plane, the pore area pallid under dissecting microscope. Asci 65–90 × 12–16 μ, oblong. Ascospores 18–22.5 × (4–)5–6(–7) μ, hyaline, obovate (the upper portion broader than the lower), straight to inequilateral, tapered to an obtuse base, (1–)3–5 (–7)-septate, slightly constricted at the primary septum, with vertical septum in one or two of mid cells.

On *Staphylea trifolia* L., eastern North America.

Material examined:

New York: Helderberg Mts., May, *C. H. Peck* (type, NYS).

Metasphaeria staphylea Dearn. & House, also described from *Staphylea,* is *Clathridium corticola* (Fuckel) Shoemaker & Müller. Dearness had annotated the type packet of Peck's fungus as *Hysterium,* but later, according to information on the packet, changed his mind about transferring the fungus. The description of *Dothiora staphyleae* Allescher in Sylloge Fungorum 16, p. 790, is very suggestive of *D. staphylina,* as is that of *Leptodothiora austriaca* Petrak in Sydowia 9: 576. 1955, and the three may be identical.

Dothiora sambucina (Peck) Barr, comb. nov. Figures 67–69.

≡ *Sphaerulina sambucina* Peck, Annual Rept. New York State Mus. 38: 106. 1885.

Ascocarps 230–245 μ diam, 180–200 μ high, often erumpent in long rows; wall 26–33(–50) μ thick; apex short and broadly papillate. Asci 52–78 × 15 μ, oblong. Ascospores 22.5–27 × 6–7.5 μ, hyaline, obovate (the upper portion broader than the lower), tapered to an obtusely pointed base, often inequilateral, (1–)3–6-septate, constricted at supramedian primary septum, with vertical septum in one or several of mid cells.

On branches of *Sambucus* sp., eastern North America.

Material examined:

New York: West Albany, May 1884, *C. H. Peck* (type, NYS).

Dothiora sphaeroides (Pers. ex Fr.) Fr. Summa Veget. Scand. 419. 1849.

≡ *Dothidea sphaeroides* Pers. ex Fr. Syst. Mycol. 2: 552. 1823.

Ascocarps 220–440 μ diam, 165–275 μ high, pulvinate with rounded apex, erumpent, thickly scattered or few connected; wall thick; thick brown hyphae forming a layer at base, thin hyphae penetrating cortical tissues of host. Asci 62–72 × 12–15 μ, parallel in a broad locule. Ascospores 20–25 × 5–6 μ, hyaline, obovate,

broadest above and tapered to a pointed base, (1–3–)5–7-septate, with vertical septum in one or several of mid cells, occasionally through upper end cell.

Conidial state: *Dothichiza tremulae* (Sacc.) v.Höhnel.

On branches of *Populus* spp., Europe, North America.

Material examined:

Ontario: Holland River Marsh, York Co., 30 Apr 1936, *H. S. Jackson* (*DAOM 86261,* Herb. of R. F. Cain).

The ascospores in this collection are slightly larger than those described from European specimens.

Dothiora schizospora Luttrell, Mycologia 52: 65. 1960.

On branches of *Symphoricarpos orbiculatus* Moench, North America.

Luttrell (1960) provided description, illustrations, and details of developmental morphology of this species.

3. Series of *D. taxicola*:

Dothiora taxicola (Peck) Barr, comb. nov. Figures 70–71.

≡ *Sphaeria taxicola* Peck, Annual Rep. New York State Mus. 24: 99. 1872.
≡ *Leptosphaeria taxicola* (Peck) Sacc. Syll. Fungorum 2: 85. 1883.
≡ *Metasphaeria taxicola* (Peck) Peck, Annual Rep. New York State Mus. 39: 58. 1886.
≡ *Sphaerulina taxicola* (Peck) Berlese, Icones Fungorum 1: 125. 1894.
≡ *Saccothecium taxicolum* (Peck) Kirschst. Kryptogamenfl. Mark Brandenburg 7(3): 427. 1938.
= *Sphaerella taxi* Cooke, Gard. Chron. 9: 274; Grevillea 6: 121. 1878.
≡ *Metasphaeria taxi* (Cooke) Oudemans, Ned. Kruidk. Arch. III, 2: 170. 1900.
≡ *Sphaerulina taxi* (Cooke) Massee, Diseases Cult. Pl. 220. 1910.

Ascocarps 130–240 μ diam, 145–165 μ high, globose or depressed, immersed with rounded erumpent apex, epiphyllous, thickly scattered; wall 14–30 μ thick, consisting of several layers of polygonal cells, blackened externally; apical pore region stuffed with lighter brown or hyaline cells before maturity. Asci 60–96 × 9–14.5 μ, clavate, arising from a low dome-shaped cushion of hyaline cells. Ascospores 13–18.5 × 3–5 μ, hyaline or yellowish, narrowly elliptic or obovate, tapered to pointed ends, straight to slightly curved, (1–)3-septate, not constricted at septa; contents minutely guttulate; wall smooth.

Conidial state: *Dothichiza* sp.: Callen (1938–1939) obtained the conidial state of the fungus in culture as well as in leaf tissue, and identified it with *Cytospora taxifolia* Cooke and Massee. The pycnidia are immersed, depressed, 418–435 μ diam, 243-352 μ high, multiloculate; conidiophores short, 7–15 × 1.5–2 μ; conidia 3–5 × 1 μ, hyaline, one-celled.

On leaves of *Taxus* spp., North America, Europe.

Material examined:

British Columbia: *DAOM 88044, 88045* [DAOM, in collections of *Asteridiella pitya* (Sacc.) Hansf.]. New York: Sandlake, May 1871, *C. H. Peck* (type of *Sphaeria taxicola,* NYS). California: *Calif. Fungi 293, 570; H. E. Parks 4400* (MICH). England: *Sphaer. Brit. 90* (as *Sphaerella taxi*).

According to descriptions and to material examined, the British and North American specimens do not differ specifically. Callen (1938–1939) described and discussed the British specimens under the name *Sphaerulina taxi.* Ascospores in British material are somewhat larger than North American, 20–37.5 × 6.5–9 μ, and occasionally become five-septate.

Dothiora slippii Barr, sp. nov.

Ascocarpia 250–300 μ diametro, pulvinata, in seriebus elongatis, peridio usque ad 60 μ crasso. Asci 48–60 × 11–13 μ, oblongi vel clavati, bitunicati. Ascosporae 17.5–24 × 3.5–4.5 μ, hyalinae, anguste obovatae, 3-septatae.

Specimen typicum in ramulis emortuis *Pini albicaulis,* prope "Looking Glass Lookout, Priest River Experimental Forest, Bonner Co., Idaho, 10 Oct 1939," legit *A. W. Slipp 584A;* in herb. Univ. Mass. depositum.

Ascocarps 250–300 μ diam, pulvinate, often in rows along a branch; apex plane, opening irregularly; wall up to 60 μ thick. Asci 48–60 × 11–13 μ, oblong to clavate, parallel from a basal cushion of hyaline cells. Ascospores 17.5–24 × 3.5–4.5 μ, hyaline, narrowly obovate, tapered to pointed ends, straight or slightly curved, 3-septate, slightly constricted at primary septum.

On branches of *Pinus albicaulis* Engelm., western North America.

Material examined:

Idaho: *A. W. Slipp 584A* (type, MASS).

This species with its pulvinate ascocarps seems to be one of the primitive taxa of the genus. *D. wolfii* is closely related, has depressed globose ascocarps and broader ascospores.

Dothiora wolfii Barr, nom. nov. Figures 73–74.

≡ *Sphaerulina polyspora* Wolf, J. Elisha Mitchell Sci. Soc. 41: 97. 1925, *non Dothiora polyspora* Shear & Davidson, 1940 (*Sydowia dothideoides* Dearn. & Barth.).

Ascocarps 200–250 μ diam, 150–200 μ high, depressed globose, grouped at times in dark reddish brown areas on a branch, or scattered; wall 20–55 μ thick. Asci 55–70 × 12–14.5 μ, oblong, parallel from a flattened basal cushion of hyaline cells. Ascospores 17.5–22 × 4.5–6 μ, hyaline, narrowly obovate, tapered to obtuse ends, inequilateral to slightly curved, (2–)3–5-septate, constricted at primary septum.

On branches of *Oxydendrum arboreum* (L.) DC., North America.

Material examined:

North Carolina: Raleigh, Mar 1924, *F. A. Wolf* (type, BPI), 5 May 1924 (BPI).

Dothiora ribesia (Fr.) Barr, comb. nov. Figures 65–66.

≡ *Dothidea ribesia* Fr. Syst. Mycol. 2: 550. 1823.
≡ *Stromatosphaeria ribesia* (Fr.) Grev. Fl. Edinburgh 257. 1824.
≡ *Plowrightia ribesia* (Fr.) Sacc. Syll. Fungorum 2: 635. 1883.
≡ *Dothidella ribesia* (Fr.) Theiss. & Syd. Ann. Mycol. 13: 309. 1915.
≡ *Phragmodothella ribesia* (Fr.) Petrak, Ann. Mycol. 17: 62. 1919.
= *Dothidea irregularis* Otth, Mitt. Naturf. Ges. Bern 102. 1870.
≡ *Plowrightia irregularis* (Otth) Sacc. Syll. Fungorum 14: 680. 1899.

Ascocarps multiloculate, 500–1000 μ diam, rounded pulvinate, the surface plane; upper portion of locules protruding and roughening surface at times; ascocarps composed of vertically oriented rows of cells forming *textura globosa* to *textura prismatica,* blackened externally, often olivaceous to blackish internally, the hyphae penetrating host tissues; locules 60–80 μ diam, 70–100 μ high. Asci 60–72 × 11–12 μ. Ascospores 15–35 × 4.5–8(–14) μ, hyaline, light dull brown in age, narrowly obovate or elliptic (the ends obtusely pointed), straight to slightly curved, (1–)3–5-septate; no vertical septa formed.

On branches of *Ribes* spp., Europe, North America.

Material examined:

Maine: *Barr 3307* (MASS). Vermont: *Barr 4313, 4590* (MASS). South Dakota: *Griffiths, West Amer. Fungi 194.* Nebraska: *Fungi Columbiana 2621* (*Clathridium corticola* also present). Washington: Marysville, May 1926, *Grant* (MASS).

The aspect of *D. ribesia,* both immature and mature, accords well with that of *D. pyrenophora. D. ribesia* has been designated as the type species of *Plowrightia,* the hyaline-spored segregate from *Dothidea*. Petrak (1919) transferred *D. ribesia* to *Phragmodothella* because he found that the ascospores became three-septate. He speculated as to whether *P. kelseyi* (Ell. & Ev.) Theiss. & Syd. was identical with *P.*

ribesia. However, *P. kelseyi,* the type species of *Phragmodothella,* is a synonym of *Clathridium massarinum* (Sacc.) Berlese, and the genus *Phragmodothella* is synonymous with *Clathridium* (Müller & Loeffler 1958).

Dothiora asterinosporum (Ell. & Ev.) Sacc. and *D. platyasca* (Peck) Sacc. were both transferred to the genus in Sylloge Fungorum 8: 766. 1889. Neither species belongs in *Dothiora,* but are species of *Myriangium* instead. *D. asterinosporum* was transferred to *Myriangium* by Miller (1940) and again by Petrak (1959a). *D. platyasca,* according to type material from NYS (*Cenangium platyascum* Peck, Alabama), is identical with *M. duriaei* Mont. & Berk.

Saccothecium Fr. Summa Veget. Scand. 398. 1894.

= *Pringsheimia* Schulzer, Verh. Zool.-Bot. Ges. Wien 16: 57. 1866.
= *Pleosphaerulina* Pass. Atti Reale Accad. Lincei, Rendiconti Cl. Sci. Fis. IV, 7: 46. 1891.
= *Schizostege* Theiss. Ann. Mycol. 14: 415. 1916.

Ascocarps depressed globose, uniloculate, immersed beneath the epidermis, becoming erumpent, usually thickly scattered, the apex broadly rounded or short papillate; wall relatively thick, several layers of large thick-walled cells forming *textura angularis,* darkened externally; inner layers of compressed cells surrounding the locule; brown hyphae extending into plant tissues. Asci arising from a central column of hyaline or yellowish cells, oblong clavate, bitunicate, rounded at apex, tapered to a foot-like base. Ascospores overlapping bi- to triseriate in the ascus, hyaline, obovate or elliptic, several-septate, constricted at submedian primary septum, enlarged above, with vertical septum in one or several of mid cells, straight to inequilateral, the contents minutely guttulate; wall smooth.

On thin dead twigs, widespread.

Conidial state produced in culture: *Aureobasidium pullulans*-like: conidia hyaline or brownish, ovate, one-celled, budding from ascospores, other conidia, or from interior walls of small pycnidia (Brefeld, 1891; Klebahn, 1918; personal observation).

Wehmeyer (1957) discussed the generic names *Pringsheimia* and *Pleosphaerulina. Schizostege* Theiss. was based on Fuckel's *Sphaeria rosicola,* and was described as a genus of the Clypeosphaeriaceae with one-celled ascospores. Theissen's (1916) figures of this fungus leave no doubt that *S. rosicola* is only immature *Saccothecium sepincola.* Petrak and Sydow (1929) noted this fact, as did Clements and Shear (1931).

Phaeodothiora Petrak (1948) was described as a genus similar to *Saccothecium* but with dark olivaceous to blackish brown ascospores. The type and only species, *P. sinensis* Petrak, is extralimital.

Type species: *S. sepincola* (Fr.) Fr.

Saccothecium sepincola (Fr.) Fr. Summa Veget. Scand. 398. 1849. Figures 75–77.

≡ *Sphaeria sepincola* Fr. Syst. Mycol. 2: 498. 1823.
≡ *Sphaerulina sepincola* (Fr.) Starb. Bot. Not. 1890: 117; Bot. Centralbl. 46: 261. 1891.
≡ *Pleosphaerulina sepincola* (Fr.) Rehm in v.Höhnel, Ann. Mycol. 18: 96. 1920.
≡ *Pringsheimia sepincola* (Fr.) v.Höhnel, Ann. Mycol. 18: 97. 1920.
= *Pringsheimia rosarum* Schulzer, Verh. Zool.-Bot. Ges. Wien 16: 57. 1866.
= *Sphaeria rosicola* Fuckel, Symb. Mycol. 114. 1870.
≡ *Physalospora rosicola* (Fuckel) Sacc. Syll. Fungorum 1: 435. 1882.
≡ *Schizostege rosicola* (Fuckel) Theiss. Ann. Mycol. 14: 415. 1916.
= *Pleosphaerulina rosicola* Pass. Atti Reale Accad. Lincei, Rendiconti Cl. Sci. Fis. IV, 7: 46. 1891.

Ascocarps 140–180 μ diam, 120–150 μ high; wall 15–24 μ thick at sides and base, up to 33 μ thick over apex, of 3–5 layers of polygonal cells. Asci 33–60 × (12–)14.5–18.5 μ. Ascospores (15–)18–26.5 × 6–9 μ, hyaline, obovate, usually broadest above and tapered to an obtuse base, 3–7-septate, constricted at the primary septum, with a vertical septum in one or several of mid cells.

On thin twigs of various woody dicotyledons, especially *Cornus* and *Rosa,* widespread.

Material examined:

British Columbia: Sidney, April 1915, *J. Macoun* (DAOM, as *Sphaerulina intermixta*). Massachusetts: *Barr 4932, 5122* (MASS). New York: Hyde Park, 16 Feb 1969, *H. E. Ahles* (MASS). Michigan: *Barr 1000B* (MASS).

This fungus is not uncommon and has been given a number of names. It has been confused with another entity, *Clathridium corticola* (Fuckel) Shoemaker & Müller, which may occur on the same twigs. *C. corticola* has unitunicate asci produced in true perithecia. Rehm (1912) was apparently the first person to try to unravel the confusion surrounding the two different fungi. Von Höhnel (1920) and Petrak (1921) discussed in some detail the various names applied to the two species. Wehmeyer (1957) again elucidated the differences between the species and traced the history of various of the names. More details on *Clathridium corticola* are available in Shoemaker and Müller (1964).

Müller and von Arx (1950) and Kreisel (1969) placed *Saccothecium sepincola* (sub *Pringsheimia*) in the Dothioraceae and I too consider *Saccothecium* to belong in this family, rather than in the Dothideaceae where others have disposed of it. Certainly asci and ascospores, as well as wall structure, are very similar in members of *Dothiora* and *Saccothecium.* The peculiar columnar mass of cells from which asci arise in the base of the locule is in my interpretation an exaggeration of the slightly raised basal area found in *Dothiora pyrenophora, D. thujae,* and *D. taxicola.*

Dothideaceae Chev. Fl. Env. Paris 446. 1826; Nits. in Fuckel Symb. Mycol. 214. 1870, emend.
= *Sphaerellaceae* Winter in Rabenh. Kryptogamenfl. Deutschland 1(2): 334. 1887.
= *Mycosphaerellaceae* Lindau in Engler & Prantl, Natürl. Pflanzenfam. 1(1): 421. 1897.

Ascocarps uni- or multiloculate, globose, depressed, or conic, or large and rounded and irregular, immersed or erumpent, scattered or grouped, the apical pore small; wall of few layers of cells forming *textura intricata* or compressed and forming *textura prismatica,* dark externally, lighter to hyaline within; cells of multiloculate ascocarps often vertically oriented, forming *textura intricata,* locule walls thin and *textura prismatica.* Asci oblong or saccate, sometimes ovoid, bitunicate, arising from a low basal cushion and forming a fascicle in the locule, octosporous, the spores rarely fewer. Ascospores biseriate or crowded in the ascus, hyaline, yellowish, or brown, elliptic, obovate, fusoid, oblong, elongate or cylindric, one-celled or one- to several-septate, the position of the primary septum median or variable; globules or groups of minute guttules one or two per cell; wall smooth or roughened, occasionally surrounded by a gelatinous coating.

Conidial states various: Sphaeropsidales: *Selenophoma, Kabatia, Septoria, Lecanosticta.* Moniliales: *Ramularia, Ovularia, Cladosporium, Cercospora, Passalora, Polythrincium, Stigmina; Aureobasidium pullulans*-like conidia and hyphae may be produced in culture. Microconidial state: *Asteromella* (often in literature as *Phyllosticta*).

On dead or living leaves, stalks, fruits, or branches of herbaceous and woody dicotyledons, on leaves and culms of monocotyledons, leaves and cones of gymnosperms, and on ferns, lycopods, mosses, and algae; cosmopolitan.

The family Dothideaceae originally included a heterogeneous assemblage of genera, and has been divided and regrouped a number of times. Luttrell (1951b) outlined the history of the family, and united the family Mycosphaerellaceae with it. The latter, originally placed in the Sphaeriales, was transferred to the Pseudosphaeriales by Theissen and Sydow (1918), a position in which it has been retained by most authors. Miller (1938, 1941, 1949) placed the family in the Dothideales, while Luttrell (1951b) pointed

out that uni- and multiloculate ascocarps may occur in the same species and reduced the Mycosphaerellaceae to synonymy with the Dothideaceae.

The genus *Curreya* Saccardo was described in Sylloge Fungorum 2: 651. 1883 as a dictyosporous representative of the Dothideaceae. *C. conorum* (Fuckel) Sacc. and *C. excavata* (Cooke & Ell.) Sacc. were the original species in the genus. Petrak (1940) redescribed *C. conorum,* noted the presence of numerous narrow filiform branched paraphyses and of associated *Coniothyrium glomerulatum* Sacc. state, and transferred the species to *Cucurbitaria* in the Pleosporales. He considered *Curreya* to be a synonym of *Cucurbitaria,* a decision in which I tentatively concur. *Curreya excavata* (Cooke & Ell.) Sacc. on branches of *Magnolia* was described with locules in a stroma, and brown muriform ascospores in cylindric asci. Ellis and Everhart (1982) disclaimed knowledge of *Curreya excavata.* They noted that the specimens in NY were *Dothidea concaviuscula.* In the presumed type collection, i.e. that of *Dothidea excavata* (Newfield, New Jersey, March 1876, NY), I too found only ascocarps of *Scirrhia concaviuscula,* but in a collection from the same locality dated 1879 (NY as *Curreya excavata*) on the same sheet there are, in addition to the *Scirrhia,* grouped ascocarps in which the asci are cylindric and the ascospores brown and muriform. This fungus is surely a species of *Fenestella* near *F. minor* Tulasne. The name *Dothidea excavata* was based on the ascocarps and locules of one fungus and the ascospores and asci of another, and is an illegitimate name. Theissen and Sydow (1915) transferred *Dothidea excavata* to *Dictyodothis* and described ascocarps typical of *Dothidea concaviuscula* (i.e. *Scirrhia*). They noted that asci were in a fascicle in the locule, without paraphyses, and were not seen mature. Ascospore details were quoted from the literature. Other species transferred to *Curreya* at later dates must be disposed of in a number of other genera.

Key to Genera

1. Ascospores one-celled, hyaline. *Discosphaerina.*
1. Ascospores septate, hyaline or pigmented.
   2. Ascospores hyaline; septum inframedian and basal cell minute (apiospores). *Omphalospora.*
   2. Ascospores hyaline or pigmented, septum (a) median or supramedian.
      3. Ascospores light brown, septum supramedian.
         4. Ascocarps uniloculate, borne in hyphae attached to sides of superficial sclerotial ectostroma. *Lasiobotrys.*
         4. Ascocarps multiloculate, the locules marginal, horizontal or nearly so. *Rhizogene*
      3. Ascospores hyaline or pigmented, septum (a) median.
         5. Ascospores cylindric or filiform, several-septate, hyaline. *Sphaerulina.*
         5. Ascospores variable in shape, 1(−3)-septate, hyaline or pigmented.
            6. Ascospores hyaline, occasionally yellowish or brownish in age, variable in shape but not broadly elliptic; globules usually two in each cell. *Mycosphaerella.*
            6. Ascospores brown early in development, broadly elliptic; globule one in each cell. *Dothidea.*

Discosphaerina v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Abt. 1, 126: 353. 1917.

Ascocarps uniloculate, black, often shining, immersed, scattered or grouped, often connected by thick hyphae and at times forming a crustose stromatic area, depressed globose, somewhat lens-shaped in section, rounded or occasionally elliptic in face view; wall thin, with two or three layers of large polygonal cells; apical pore small or irregularly shaped. Asci oblong, occasionally ovoid, bitunicate, relatively numerous in a broad fascicle, sessile or the base foot-like. Ascospores overlapping biseriate to triseriate in the ascus, hyaline, elliptic, obovate, oblong, or fusoid, one-celled; contents minutely guttulate; wall smooth, at times surrounded by a thin gelatinous coating.

Conidial state: *Selenophoma* Maire: Pycnidia dark, globose, similar in aspect to ascocarps; conidiophores as wall cells lining locule; conidia hyaline, one-celled, lunate or falcate (illustrated by Müller 1957). *Kabatia* Bubák: Pycnidia dark, depressed or hemis-

pherical, opening widely; conidiophores short, lining base of locule; conidia hyaline, ovoid or clavate, one-septate; upper cell broad, basal cell stalk-like, often curved or bent (illustrated by Müller 1953a). *Aureobasidium pullulans*-like conidia may be produced in culture (illustrated by Hudson 1966). Microconidial state: *Asteromella*: Pycnidia small, wall dark; conidiophores short, lining locule; conidia hyaline, minute, oblong, one-celled.

On overwintered leaves or stalks of herbaceous or woody dicotyledons, leaves or culms of monocotyledons, widespread.

The generic concepts of *Botryosphaeria, Guignardia,* and *Discosphaerina* and my interpretation of the taxa involved are discussed under the former genus.

Type species: *D. discophora* v.Höhnel.

Discosphaerina discophora v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. 1, 126: 353. 1917.

≡ *Guignardia discophora* (v.Höhnel) Petrak, Ann. Mycol. 19: 111. 1921.
= *Guignardia steppani* Petrak, Ann. Mycol. 18: 111. 1920.

Ascocarps 90–120 μ diam, 80 μ high, depressed globose, often connected by hyphae to form stromatic crusts; wall thin and 6–12 μ thick at base and lower sides, up to 25 μ thick toward apex. Asci 32–52 × 5–9 μ. Ascospores (6–)8–14 × 2.5–3(–4) μ, hyaline, fusoid, straight to inequilateral, biseriate in the ascus.

On overwintered leaves of *Solidago virgaurea* L., Europe.

No specimens identified as this fungus have been found as yet from North America. The description is derived from the literature and from extralimital specimens.

Additional species:

Discosphaerina fagi (Hudson) Barr, comb. nov. Figures 78–80.

≡ *Guignardia fagi* Hudson, Nova Hedwigia 10: 323. 1966.

Ascocarps 60–80 μ diam, 40–60 μ high, loosely grouped along sides of main leaf veins, epiphyllous, subcuticular; wall 8–10 μ thick, with one to two layers of dark brown cells. Asci 22–39 × 9–11 μ, oblong. Ascospores 9–15 × 2.5–3.5 μ, hyaline, fusoid, usually inequilateral, occasionally straight or slightly curved, at times with a delicate gelatinous coating, overlapping bi- to triseriate in the ascus.

Conidial state: *Aureobasidium pullulans*-like conidia and hyphae are produced in culture (Hudson 1966).

On overwintered leaves of various deciduous trees, Europe; *Acer saccharum* Marsh., North America.

Material examined:

Massachusetts: *Barr 2906* (MASS).

The collection cited has somewhat smaller asci and ascospores than those originally described. Hudson (1966) described the species from overwintered leaves of *Fagus sylvatica* and found it to occur on leaves of a number of other trees.

Discosphaerina boltoniae (Dearn. & Barth.) Barr, comb. nov.

≡ *Guignardia boltoniae* Dearn. & Barth. in Dearn. Mycologia 18: 245. 1926.

Ascocarps 70–120 μ diam, thickly scattered, connected by brown hyphae; wall thin, about 10 μ thick. Asci 57–60 × 15–18 μ, oblong. Ascospores 15–18 × 4.5–6 μ, hyaline, elliptic or fusoid, straight, overlapping biseriate in the ascus.

Conidial states: *Selenophoma* (*Macrophoma boltoniae* Dearn. & Barth.): Pycnidia similar to ascocarps; conidia 17–22 × 5–7 μ, hyaline, fusoid. Microconidial: *Asteromella* (*Phoma boltoniae* Dearn. & Barth.): Pycnidia 80 μ diam, similar to ascocarps; conidia 6–7.5 × 2–3 μ, hyaline, oblong, one-celled.

On stalks of *Boltonia diffusa* Ell., North America.

Material examined:

Oklahoma: Devol, 8 May 1923, *Bartholomew* (type, *Dearness Herb. 5762* in DAOM).

Discosphaerina tofieldiae (F. Tassi) Barr, comb. nov.

≡ *Laestadia tofieldiae* F. Tassi, Bull. Lab. Orto Bot. Reale Univ. Siena 4: 7. 1901.
≡ *Guignardia tofieldiae* (F. Tassi) v.Arx & Müller, Beitr. Kryptogamenfl. Schweiz 11(1): 59. 1954.

Ascocarps 50–70 μ diam, thickly scattered to grouped, connected by brown hyphae and blackening leaf surface; wall thin. Asci 28.5–40 × 9–11 μ, oblong, sessile. Ascospores 9–13 × 2–3.5 μ, hyaline, obovate oblong, straight, crowded in the ascus, the ends rounded.

On leaves of *Tofieldia* spp., Europe, North America.

Material examined:

Northwest Territories: *Bartlett 2722* (MICH).

Discosphaerina circumtegens (Rostr.) Barr, comb. nov.

≡ *Laestadia circumtegens* Rostr. Meddel. Grønland 3: 547. 1888.

Ascocarps 160–240 μ diam, 100–140 μ high, thickly scattered, with brown connecting hyphae; wall 15 μ thick, blackish brown. Asci 36–45 × 9–12 μ, oblong and sessile, or the base foot-like. Ascospores overlapping bi- to triseriate in th ascus, 10.5–13.5 × 3.5–6 μ, hyaline, oblong, straight to inequilateral (the ends rounded), at times surrounded by a thin hyaline gelatinous coating.

On *Erigeron filifolius* (Hook.) Nutt., Greenland , North America.

Material examined:

Washington: Wenatchee River valley, Leavenworth, 23 June 1933, *Hedgcock* (MASS).

Omphalospora Theiss. & Syd. Ann. Mycol. 13: 361. 1915.

= *Plectosphaerella* Kirschst. Kryptogamenfl. Mark Brandenburg 7(3): 310. 1938, *non* Klebahn 1931.
= *Plectosphaerina* Kirschst. Ann. Mycol. 36: 368. 1938.

Stromata crustose; ascocarps subcuticular, multiloculate or uniloculate and thickly grouped with connecting hyphae blackening substrate; cells of stromatic tissue arranged in vertically oriented rows, forming *textura angularis*; cells near margin forming *textura epidermoidea*; locule wall thin, of one or two layers of cells; pore small, apical. Asci ovoid or subglobose, few, bitunicate, sessile. Ascospores crowded in the ascus, hyaline, obovate, rounded and broad above, tapered to a pointed base, septate near base, not constricted at septum; contents with one or two globules in upper cell, one in lower cell; wall smooth.

Conidial state not known.

On leaves and stalks of herbaceous dicotyledons, widespread.

The generic name *Ascospora* Fries (Summa Veget. Scand. 425. 1849) has been applied by several authors to species of *Omphalospora.* Von Höhnel (1919b) detailed the history of *Ascospora.* The name must be rejected because it has been used in different senses and so has become a long-persistent source of error (Art. 69, International Code of Botanical Nomenclature).

Petrak (1940) discussed *Plectosphaerina* Kirschstein which replaced *Plectosphaerella* Kirschstein. The genus is taxonomically superfluous as the species included within it are congeneric with *Omphalospora stellariae.*

Type species: *O. stellariae* (Lib.) Theiss. & Syd.

Omphalospora stellariae (Lib.) Theiss. & Syd. Ann. Mycol. 13: 361. 1915. Figures 81–83.

≡ *Dothidea stellariae* Lib. Pl. Crypt. Arduenn. exs. n. 172. 1832.
≡ *Euryachora stellariae* (Lib.) Fuckel, Symb. Mycol. 220. 1870.
≡ *Phyllachora stellariae* (Lib.) Schroet. in Cohn, Kryptogamenfl. Schlesien 3(2): 471. 1894.
≡ *Dothidella stellariae* (Lib.) Lind, Ann. Mycol. 3: 428. 1905.

Stroma crustose, at times extending over entire leaf, 30–45 μ deep; locules 32–45 μ diam. Asci 15–21 × 9–10.5(–12) μ. Ascospores 9–11 × 2–3 μ; lower cell 1–2 μ wide and long.

On leaves and stalks of *Stellaria* spp., northern Europe, North America.

Material examined:

Alaska: *Jordal 2106* (MICH).

This species is the only representative of the genus which I have seen from North America. *Omphalospora* is closely related to *Euryachora* Fuckel. The type species of the latter genus, *E. sedi* (Fr.) Fuckel, blackens areas of stalks and leaves of *Sedum* spp. in Europe. The ascospores of *E. sedi* are septate in the middle, and this characteristic appears to be the major one distinguishing *Euryachora* from *Omphalospora.*

Mycosphaerella Johanson, Ofvers. Förh. Kongl. Svenska Vetensk.-Akad. 41: 163. 1884, *non* Saccardo 1891.

≡ *Sphaeria* Sect. *Sphaerella* Fr. Summa Veget. Scand. 395. 1894, *non Sphaerella* Sommerfelt 1824.
≡ *Sphaerella* (Fr.) Rabenh. Herb. Viv. Mycol. ed. 2, n. 264. 1856.
= *Septorisphaerella* Klebahn, Haupt- und Nebenfruchtformen der Askomyzeten 131. 1918.
= *Ramularisphaerella* Klebahn, Haupt- und Nebenfruchtformen der Askomyzeten 131. 1918.
= *Cercosphaerella* Klebahn, Haupt- und Nebenfruchtformen der Askomyzeten 132. 1918.
= *Didymellina* v.Höhnel, Ann. Mycol. 16: 66. 1918.
= *Ovosphaerella* Laibach, Centralbl. Bakteriol. Abth. 2, 53: 559. 1921; 55: 293. 1922.
= *Cymadothea* Wolf, Mycologia 27: 71. 1935.

Ascocarps uni- or multiloculate, immersed becoming erumpent, globose, conic, or depressed, scattered singly or grouped or connected by hyphae to form stromatic masses, at times as compact stromata containing several locules; apex plane or papillate, opening by small pore; wall thin to medium thick, of one to four layers of brownish black polygonal cells. Asci oblong, elongate, saccate, ovoid, or rarely short clavate, bitunicate, sessile or nearly so, numerous or few. Ascospores overlapping biseriate or crowded or in a fascicle in the ascus, hyaline, at times dull brownish in age, elliptic, obovate, oblong, fusoid, or elongate; septum nearly median, constricted or not; occasionally one or two secondary septa formed in age; globules usually two per cell; wall smooth, at times roughened in age, occasionally surrounded by a gelatinous coating.

Conidial states variable: *Septoria* Sacc.: Pycnidia globose or flask-shaped, the wall thin; conidiophores as cells of inner wall, short; conidia hyaline, elongate fusoid, straight or curved, one-celled to several-septate, the wall smooth (see von Arx 1970 for illustration).

Lecanosticta Syd.: Pycnidia as shallow open chambers in upper portion of stroma; conidiophores a compact hyaline basal layer of short cells; conidia brown, elongate fusoid, straight or curved or bent, one- to several-septate, the wall roughened in age. (Wolf and Barbour 1941 illustrate this state).

Ramularia Unger: Conidiophores single or clustered in a fascicle, arising from a stromatic base or vegetative hyphae or from apex of sterile ascocarps, hyaline or light brown, one-celled or septate, elongate, growing sympodially, the scars of conidia indistinct; primary conidium a terminus spore as blown-out end of conidiophore apex, often budding from apex to produce a chain of blastospores, branching at times, hyaline or brown, one-celled or several-septate, oblong, elongate, or fusoid; wall

smooth. (*Didymaria* Corda was segregated from *Ramularia* by the one-septate conidia.) In *Ovularia* Sacc. the primary conidia do not produce blastospores. *Ramularia* and *Ovularia* are illustrated by von Arx (1970).

Cladosporium Link ex Fries: Conidiophores single or in a fascicle from vegetative hyphae or from stromatic base, brown, septate, elongate, growing sympodially, often denticulate, bearing distinct conidial scars; conidia hyaline or brown, terminal, single or in short to long simple or branched chains of blastospores, one-celled to several-septate, oblong, elliptic, or subglobose; wall smooth or roughened. *Heterosporium* Cooke has been segregated from *Cladosporium* for species with conidia several-septate. De Vries (1952) considered *Heterosporium* a synonym of *Cladosporium.* He illustrated a number of species. *Scolicotrichum* has been utilized; the name is a nomen confusum according to Hughes (1958).

Cercospora Fres.: Conidiophores single or in a fascicle, arising from stromatic base or vegetative hyphae or from apex of sterile ascocarps, hyaline to brown, one-celled or septate, oblong, straight or curved, smooth or denticulate; scars of conidia often distinct; conidia (blastospores) pigmented, elongate fusoid to nearly cylindric, straight or curved, one-celled or septate, terminal, single, becoming lateral by sympodial development of the conidiophore; wall smooth. *Cercosporella* Sacc. has hyaline conidia. *Isariopsis* Fr. in Sacc. is also similar to *Cercospora* but the conidiophores are closely connected to form a synnema. (Illustrated by Chupp 1953).

Passalora Fr.: Much as in *Cercospora;* conidia one-septate, nearly cylindric. *Cercosporidium* Earle has been segregated from *Passalora.* (Illustrated by Deighton 1967).

Polythrincium Kunze ex Fr.: Conidiophores in fascicles from stromatic base, dark brown, one-celled or septate, wavy in outline, growing sympodially, geniculate; conidial scars distinct; conidia terminal blastospores, single, elliptic to obovate, brown, one-septate; wall roughened. (Wolf 1935 illustrated *P. trifolii*).

Stigmina Sacc.: Conidiophores in a fascicle from stromatic base, emerging through stomata of the host tissue, brown, septate, annellophores; conidia ovate, elliptic or oblong annellospores, brown, one- to several-septate; wall roughened at times (*S. platani* was illustrated by Wolf 1938). Microconidial state: *Asteromella* Pass. & Thümen (often referred to in the literature as *Phoma* or *Phyllosticta*; Müller and von Arx (1962) noted that *Stictochorella* v.Höhnel and *Plectophoma* v.Höhnel were identical with *Asteromella.*) Uniloculate or multiloculate pycnidia lined by hyaline cells which produce minute microconidia (spermatia), these hyaline, oblong, one-celled.

On overwintered leaves, stalks, fruits, or twigs of many dicotyledonous plants, on monocotyledons, ferns, gymnosperms, mosses, algae, occasionally parasitic, cosmopolitan.

The generic synonymy is probably incomplete. Klebahn's and Laibach's names were to designate those species of *Mycosphaerella* which had a particular conidial state. *Didymellina* is retained at subgeneric level, although arguments for separating the species from those of *M.* subgenus *Mycosphaerella* do have merit. *Cymadothea* was reduced to synonymy with *Mycosphaerella* by Petrak (1941).

The genus *Mycosphaerella* is rich in species—though probably not as many exist as published descriptions would suggest. Details of subdivision of the genus and of the relative merits of many species of *Mycosphaerella* have not been worked out yet. I present here a tentative outline of classification. Two subgenera are recognized as distinct by the shape of the asci and the conidial states. Perhaps two distinct genera are represented, as has been suggested in the past; for the present all the taxa are retained under *Mycosphaerella.* Each subgenus is further divided into several sections based on ascospore type and/or habit. These taxonomic groups are delimited in a key. Within each section groups of species can be recognized, which I am designating as series but for which I have not provided names. The species described within a series include the one which typifies the series and usually one or more in addition.

Key to Subgenera and Sections

1. Asci numerous in a fascicle, oblong, elongate, or clavate; ascospores overlapping biseriate or in a fascicle in the ascus; conidial state belonging to *Septoria, Lecanosticta, Ramularia, Cercospora,* or variants. Subg. *Mycosphaerella.*
   2. Ascospores fusoid or elliptic fusoid; ends pointed.
      3. Ascocarps parasitic, maturing in spots in living leaves; spots usually limited by a marginal zone. Sect. *Plaga.*
      3. Ascocarps saprobic, maturing in overwintered leaves or stalks.
         4. Ascospores elongate; length to width ratio more than 6:1 Sect. *Longispora.*
         4. Ascospores shorter; length to width ratio less than 6:1. Sect. *Caterva.*
   2. Ascocarps obovate, oblong, or elliptic; ends rounded.
      5. Ascocarps parasitic, maturing in spots in living leaves; spots usually limited by a marginal zone. Sect. *Macula.*
      5. Ascocarps saprobic, maturing in overwintered leaves or stalks. Sect. *Mycosphaerella.*
1. Asci relatively few in a fascicle, saccate, ovoid, or broadly oblong; ascospores crowded in the ascus; conidial state belonging to *Cladosporium, Passalora, Polythrincium, Stigmina,* or variants. Subg. *Didymellina.*
   6. Ascospores fusoid; ends pointed. Sect. *Fusispora.*
   6. Ascospores obovate; ends rounded.
      7. Conidial state conspicuous, causing leaf blotches.
         8. Conidial state *Polythrincium,* sympodiosporous. Sect. *Cymadothea.*
         8. Conidial state *Stigmina,* annellosporous. Sect. *Stigmina.*
      7. Conidial state not so conspicuous.
         9. Ascocarps parasitic, maturing in spots in living leaves; spots usually limited by a marginal zone. Sect. *Didymellina.*
         9. Ascocarps saprobic, maturing in overwintered leaves or stalks. Sect. *Tassiana.*

Subgenus **Mycosphaerella.**

Asci oblong, elongate, occasionally clavate, numerous in a broad fascicle arising from low basal layer of small cells. Macroconidial state variable.

Section **Mycosphaerella.**

Ascocarps saprobic; ascospores obovate, oblong, or elliptic; ends rounded.
Lectotype species: *M. punctiformis* (Pers. ex Fr.) Starb.

1. Series of *M. punctiformis*: Ascospores small, (6.5–)8–13(–14) × 2–4 μ.

Mycosphaerella punctiformis (Pers. ex Fr.) Starb. Bihang Kongl. Svenska Vetensk.-Akad. Handl. 15, afd. III, n. 2: 9. 1889; Schroet. in Cohn, Kryptogamenfl. Schlesien 3(2): 333. 1894. Figures 84-86.

≡ *Sphaeria punctiformis* Pers. ex Fr. Syst. Mycol. 2: 525. 1823.
≡ *Sphaerella punctiformis* (Pers. ex Fr.) Rabenh. Herb. Viv. Mycol. ed. 2, n. 264. 1856.
≡ *Ramularisphaerella punctiformis* (Pers. ex Fr.) Klebahn, Ber. Deutsch. Bot. Ges. 36: General Versamml. 57. 1919.
= *Sphaeria maculaeformis* Pers. ex Fr. Syst. Mycol. 2: 524. 1823.
≡ *Sphaerella maculaeformis* (Pers. ex Fr.) Auersw. in Gonnerm. & Rabenh. Mycol. Eur. 5/6: 5. 1869.
≡ *Mycosphaerella maculaeformis* (Pers. ex Fr.) Schroeter in Cohn, Kryptogamenfl. Schlesien 3(2): 333. 1894.

Ascocarps immersed becoming erumpent, scattered or grouped, connected by hyphae at times, usually hypophyllous, globose or depressed, 60–115 μ diam, the apex papillate. Asci 27–40(–50) × 5–8 μ oblong. Ascospores (6.5–)8–13(–14) × 2–4 μ, hyaline, minutely guttulate, oblong or obovate, straight, rarely inequilateral; upper cell broader and slightly shorter than lower.

Conidial state: *Ramularia*: Conidia 4–20 × 2–3.5 μ, hyaline, oblong, one-celled, forming chains of blastospores.

On overwintered leaves of various deciduous trees and shrubs, cosmopolitan.

This species is extremely common and may be found on a great variety of overwintered leaves. Several forms and varieties have been based on different host plants. Variations in such characters as grouped or scattered ascocarps and size range of ascospores have been utilized to erect a number of species. Although *M. punctiformis* may be a collective name for several entities, the name is retained at least until more evidence is available.

Additional species:

Mycosphaerella millepunctata (Desm.) Barr, Mycologia 62: 382. 1970.

For synonyms of this species see Barr (1970).

Ascocarps mostly epiphyllous, thickly scattered, 80–90 μ diam, the apex bluntly conic; wall thick, 10–13 μ thick at base, up to 18 μ near apex. Asci 30–40 × 4.5–6 μ. Ascospores 7.5–9 × 2.5–3 μ, hyaline, oblong, straight; upper cell not distinctly broader than lower.

On overwintered dead leaves of *Rhododendron* spp., Europe, North America.

Material examined:

Europe: *Desm. Pl. Crypt. 91* (isotype); *Westendorp Herb. Crypt. 468* (both as *Dothidea millepunctata,* NY). North America: North Carolina: Roan Mt., 28 July 1889, *Scribner* (on specimen of *Hendersonia concentrica,* NY). Virginia: Mountain Lake Biological Station, 11 July 1969, *C. Wolfe* (MASS).

Mycosphaerella pseudomaculaeformis (Desm.) Schroet. in Cohn, Kryptogamenfl. Schlesien 3(2):337. 1894.

≡ *Sphaeria pseudomaculaeformis* Desm. Ann. Sci. Nat. Bot. III, 6: 83. 1846.
≡ *Sphaerella pseudomaculaeformis* (Desm.) Auersw. in Gonnerm. & Rabenh. Mycol. Europ. 5/6: 12. 1869.

Ascocarps 60–96 μ diam, globose to depressed, grouped and forming small dark spots, mostly hypophyllous; wall thin. Asci 22–30 × 6.5–7.5 μ. Ascospores 7.5–10 × 2–2.5 μ, hyaline, elliptic or obovate, straight to slightly curved.

Conidial state: *Ramularia:* (*Ovularia bulbigera* (Fuckel) Sacc., *Scolicotrichum bulbigerum* Fuckel). Conidia 9–11 μ diam, globose, hyaline, one-celled.

On overwintered leaves of *Sanguisorba* spp., Europe, North America.

Material examined:

Newfoundland: Wild's Bight, 17 Aug 1859, *Wilce* (MASS).

Mycosphaerella scirrhoides Barr, nom. nov.

≡ *Scirrhia lineata* Dearn. & House, Circ. New York State Mus. 24: 31. 1940 (without Latin diagnosis).

Stromata usque ad 2 mm longa, loculo 50–72 μ diametro. Asci 33–45 × 9–10.5 μ. Ascosporae 9–11 × 3 μ, hyalinae, obovatae, uniseptatae.

Specimen typicum in folius emortuis *Caricis strictae,* prope "Carey Pond, 4th Lake, Herkimer Co., New York, 9 Aug 1917," legit *H. D. House*; in Herb. New York State Museum depositum.

Stromatic complexes up to 2 mm long, composed of loosely grouped brown hyphae surrounding locules, immersed erumpent; locules 50–72 μ diam, connected at sides; wall thin. Asci 33–45 × 9–10.5 μ. Ascospores 9–11 × 3 μ, hyaline, obovate, tapered evenly to base, straight.

On overwintered leaves of *Carex stricta* Lam., North America.

Material examined:

New York: Carey Pond, 4th Lake, Herkimer Co., 9 Aug 1917, *House* (NYS, type).

The type specimen is sparse, but as the name is in the literature, a Latin diagnosis is provided to validate it. The new name *Mycosphaerella scirrhoides* is proposed to

avoid confusion with *Mycosphaerium lineatum* Clements, Bull. Torrey Bot. Club 30: 84. 1903.

2. Series of *M. cassiopes*; Ascospores medium-sized, 12–16 × 3–4.5 μ.

Mycosphaerella cassiopes Barr, Contr. Inst. Bot. Unit. Montréal 73: 14. 1959.

Barr (1959) described and illustrated the species from northern North America. It is also found in northern Europe.

Sect. **Macula** Barr, sect. nov.

In foliis vivis; ascosporae obovatae, oblongae, vel ellipticae, extremitatibus rotundatis.

Species typicum: *M. chimaphilae* (Ell. & Ev.) v.Höhnel.

Parasitic; ascocarps developing and maturing in spots in living leaves; spots usually limited by a marginal zone; ascospores obovate, oblong, or elliptic, the ends rounded.

1. Series of *M. chimaphilae:* Ascospores small, 7.5–13 × 2–3.5 μ.

Mycosphaerella chimaphilae (Ell. & Ev.) v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. 1, 126: 355. 1917. Figures 87–89.

Leaf spots 1–10 mm wide, on the upper leaf surface reddish brown, the margin indistinct, lighter brown; spots on lower surface light brown with dark brown or reddish brown margin; ascocarps amphigenous, 75–135 μ diam, globose depressed, immersed to erumpent; apex rounded, depressed at times when dried; wall relatively thick. Asci 30–51 × 7–9.5 μ. Ascospores 9–13 × 2–3 μ, hyaline, narrowly obovate, straight to inequilateral.

On leaves of *Chimaphila umbellata* (L.) Bart. var. *cisatlantica* Blake, *Pyrola secunda* L., North America.

Material examined:

Ontario: *TRTC 4250* (MICH). New York: Cooperstown Junction, June, *Peck* (type of *M. chimaphilae* Peck, NYS). Michigan: *Povah Fp604* (MICH).

Parmelee (1958) discussed the synonymy of this species, which was described twice in the same year. He is of the opinion that the North American specimens are identical with *Sphaeria pyrolae* Fries, from Europe. Because of confusion over the identity of the latter name Parmelee preferred to use the North American one which is authenticated by a type specimen.

Mycosphaerella clintoniana (House) House, Bull. New York State Mus. 233–234: 26. 1921.

≡ *Sphaerella clintoniana* House, Bull. New York State Mus. 205–206: 40. 1919.
≡ *Sphaerella rhododendri* Cooke, J. Bot. 21: 108. 1883, *non* de Not. 1863.

Leaf spots extending from tip and sides toward middle, brown, grayish at times, the margin dark brown, slightly raised; ascocarps epiphyllous, 70–100 μ diam, globose, immersed erumpent, in small groups; wall thin. Asci 27.5–44 × 5.5–9 μ. Ascospores 7.5–10 × 2–3.5 μ, hyaline, oblong, straight.

On leaves of *Rhododendron* spp., Europe, North America.

Material examined:

Europe: *Sydow, Mycotheca March. 4423; Roumeguere, Fungi Gallici exs. 2744; Vize, Micro-Fungi Brit. 299.* North America: Oregon: Rhododendron, 5 Nov 1930, *Hansbrough* (all as *Sphaerella rhododendri* Cooke, NY).

2. Series of *M. arbuticola:* Ascospores medium-sized, 11–21 × (2.5–)3–5(–6) μ.

Mycosphaerella arbuticola (Peck) Barr, comb. nov.

≡ *Sphaerella arbuticola* Peck, Bull. Torrey Bot. Club 10: 75. 1883.

Leaf spots 2–8 mm diam, brown with dark brown raised margin; ascocarps 75–128 μ diam, globose, epiphyllous, scattered or grouped; wall thin. Asci 40–58 × 9–13 μ. Ascospores 13.5–19 × 3.5–5 μ, hyaline, elliptic or narrowly obovate, straight to slightly curved, obliquely uniseriate or biseriate in the ascus.

On leaves of *Arbutus menziesii* Pursh, western North America.

Material examined:

Washington: Seattle, June 1892, *Piper* (NYS). California: Santa Cruz, July, *Pringle* (type of *S. arbuticola,* NYS); *Ell. & Ev. N.A.F. 1682.*

Ellis and Everhart (1892) included *Sphaerella umbellulariae* Cooke and Harkness as a synonym of *Sphaerella arbuticola. S. umbellulariae* differs from the latter species in having hypophyllous ascocarps and in the pointed basal end of the ascospores. The host genera are from two different orders also. Until inoculation experiments prove the connection, I prefer to recognize two species.

Mycosphaerella pachystimae Dearness, Mycologia 18: 246. 1926.

Leaf spots 2–5 mm wide, gray with raised brown margin; ascocarps 100–140 μ diam, globose or conic, mostly epiphyllous, scattered; wall thin. Asci 51–66 × 10.5–15 μ, often appearing too large for the mature ascospores and much residual cytoplasm remaining. Ascospores 15–21 × 4.5–6 μ, hyaline, elliptic, straight to inequilateral, or the lower cell bent.

On *Pachystima myrsinites* (Pursh) Raf., western North America.

Material examined:

Idaho: Coolin, 27 July 1924, *Boyce* (type, *Dearness Herb. 5667* in DAOM).

Mycosphaerella impatientis (Peck & Clinton) House, Bull. New York State Mus. 233–234: 28. 1921.

≡ *Sphaerella impatientis* Peck & Clinton, Annual Rep. New York State Mus. 30: 67. 1878.

Leaf spots reddish brown to dull brown, angular, not distinctly margined; ascocarps 52–182 μ diam, globose, mostly hypophyllous, thickly grouped; wall thin. Asci 22–50 × 8–12.5 μ. Ascospores 11–14.5(–16) × 2.5–3.5(–5) μ, hyaline, elliptic or obovate, inequilateral to slightly curved.

Conidial state: *Septoria:* Pycnidia 90–210 μ diam, amphigenous; conidia 19–28 × 1.5–2 μ, hyaline, filiform, 0–1-septate, curved.

On *Impatiens capensis* Meerb., *I. pallida* Nutt., eastern North America.

Material examined:

New York: Buffalo, June, *Clinton* (type, NYS); *Thümen, Mycotheca univ. 963.* Michigan: Ann Arbor, 3 July 1890, *Spalding, Newcombe,* two packets (MICH).

The pycnidia of the *Septoria* resemble ascocarps and the two states are intermingled on the same spots.

Sect. **Caterva** Barr, sect. nov.

In foliis et caulibus emortuis; ascosporae fusoideae, extremitatibus acutis.

Species typicum: **M. dearnessii** Barr.

Saprobic; ascospores fusoid, the ends pointed.

1. Series of *M. dearnessii*: Ascospores small, 10–14 × 2–3.5 μ.

Mycosphaerella dearnessii Barr, nom. nov. Figures 94–95.

≡ *Oligostroma acicola* Dearn. Mycologia 19: 251. 1926, not *M. acicola* (Cooke & Harkn.) Lindau (1897).

≡ *Scirrhia acicola* (Dearn.) Siggers, Phytopathology 29: 1076. 1939.
≡ *Systremma acicola* (Dearn.) Wolf & Barbour, Phytopathology 31: 70. 1941.

Ascocarps multiloculate, elliptic, 285–400 μ long or up to 2.5 mm long by confluence, 78–110(–300) μ wide, up to 190 μ high, immersed erumpent; locules 49–80 μ diam, often in a single row. Asci (30–)35–42 × 6–9 μ. Ascospores 9–14(–16) × 2.5–3(–4) μ, hyaline, fusoid, straight to inequilateral.

Conidial state: *Lecanosticta acicola* (Thüm.) Syd.: Stromata elongate, erumpent, the locules opening widely, the bases lined with short hyaline conidiophores; conidia 20–28 × 2.5–3 μ, brown, elongate, tapered at apex, blunt at base, 3-septate, bent, the wall roughened. Microconidial state: locules in immature stromata contain microconidia, these hyaline, 2–3 × 1 μ, 1-celled.

On leaves of *Pinus* spp., North America, Europe.

Material examined:

Ohio: Waterloo State Forest, Athens Co., 26 Feb 1936, *Green* (BPI). Iowa: 1949 (BPI). Kansas: Oswego, Labette Co., 1 Apr 1952, *King* (BPI). North Carolina: Durham, 20 Apr 1940, *Wolf* (BPI, NY); Duke Forest, Durham, Feb 1937, *Hartley* (BPI). Missouri: Nov 1944, *Bretz* (BPI). South Carolina: Hampton Co., Aug 1941, *Allen* (BPI). Arkansas: Fordyce, 19 May 1929, *Chapman* (BPI). Alabama: Conecuh Nat. For., 27 Sept 1937, *Lamb* (BPI); Citronella, 12 Mar 1946, *Pfaffman* (BPI). Mississippi: Brooklyn, 11 Mar 1941, *Siggers* (BPI). Louisiana: Chapman Forest, Urania, 9 Mar 1939, *Siggers* (BPI); Woodworth, 28 Jan 1939, *Siggers* (BPI); 28 Jan 1938 (BPI); Bogalusa, 12 Feb. 1941, *Siggers* (BPI); 14 Feb 1939 (PBI). Texas: Rusk, 9 May 1938, *Young* (BPI). Florida: Gainesville, Alachua Co., 6 Feb 1944, *Rhoads* (BPI); Camp Pinchot, 10 Sept 1938, *Siggers* (BPI).

The generic disposition of this species has been puzzling to all who worked with it. Siggers (1939, 1944), Wolf and Barbour (1941) and Wolf and Wolf (1947) argued about the position of the fungus. They followed the original separation of the Phyllachoraceae and Dothideaceae by Theissen and Sydow (1915), based on insertion of the ascocarp. Petrak (1962) in his description of the disease from Austria stated that *Scirrhia acicola* was neither *Scirrhia* nor *Oligostroma* nor typical *Systremma* and suggested that more study of the species was needed. When one recognizes the variability and possible intergradation between single ascocarps, grouped ascocarps, and multiloculate ascocarps, use of this character as a generic one becomes impossible. Then locule and ascus development are of paramount importance in the assignment of this species to the Dothideaceae. All characters accord well with *Mycosphaerella* subgenus *Mycosphaerella.* The *Lecanosticta* conidial state seems to be not far from *Septoria,* species of which are associated with other species of *Mycosphaerella* in the subgenus and section.

Mycosphaerella caulicola (Karst.) Lind, Danish Fungi 208. 1913.

≡ *Sphaerella caulicola* Karst. Mycol. Fenn. 2: 169. 1873.

Ascocarps 90–200 μ diam, depressed globose, thickly grouped and forming elongate blackened areas on stalks, immersed, connected by brown hyphae; wall thin. Asci 35–50 × 6–9.5 μ. Ascospores 10.5–12 × 2.5–3.5 μ, hyaline, narrowly obovate, fusoid, tapered to base, straight or inequilateral.

On overwintered stalks of herbaceous plants, Europe, North America.

Material examined:

Europe: *Rehm Ascomyceten 648b.* Quebec: *Barr 2022* (DAOM, MASS). Ontario: *Ell. & Ev. N.A.F. 2538* (as *Sphaerella monardae* Ell. & Ev. n.s. ined.).

2. Series of *M. populorum:* Ascospores medium-sized, (9–)12–18(–21) × 2.5–4(–5) μ.

Mycosphaerella populorum G. E. Thompson, Phytopathology 31: 246. 1941. Figures 96–97.

Ascocarps globose or conic, 55–144 μ diam, scattered or thickly grouped and forming small blackened areas, amphigenous; wall thin. Asci 35–58(–70) × (9–)11–16 μ. Ascospores (12–)15–21(–28) × (3.5–)4.5–5(–6) μ, hyaline, fusoid or narrowly elliptic, straight to slightly curved.

Conidial state: *Septoria musiva* Peck: Pycnidia 48–120 μ diam; conidia 28–54 × 3.5–4 μ, hyaline, cylindric, 1–4-septate. Microconidial state: Pycnidia 48–80 μ diam; conidia 4–6.5 × 1.5 μ, hyaline, 1-celled, oblong (Thompson 1941).

On overwintered leaves of *Populus balsamifera* L. and other species of *Populus,* eastern North America.

Material examined:

Ontario: *DAOM 5130* (MICH). Massachusetts: *Barr 3207* (MASS). Michigan: *Barr 741* (MASS).

Mycosphaerella spleniata (Cooke & Peck) House, Bull. New York State Mus. 233–234: 30. 1921.

≡ *Sphaerella spleniata* Cooke & Peck, Annual Rep. New York State Mus. 25: 105. 1873.

Ascocarps 90–135 μ diam, globose or conic, hypophyllous, thickly grouped and forming blackish blotches; wall thin. Asci 48–72 × 7–9.5 μ. Ascospores (9–)14–17.5 × 2.5–3.5 μ, hyaline, elliptic with fusoid ends, straight to inequilateral.

On overwintered leaves of *Quercus* spp., North America.

Material examined:

New York: N. Greenbush, June, *Peck* (type, NYS); *Thümen, Mycotheca univ. 647.* Kansas: *Ell. & Ev. N.A.F. 3110.* Colorado: *Fungi Columbiani 3878.*

Mycosphaerella caricis (Dearn. & House) Petrak & Sydow, Ann. Mycol. 22: 383. 1924.

≡ *Laestadia caricis* Dearn. & House, Bull. New York State Mus. 205–206: 52. 1918.
≡ *Guignardia caricis* (Dearn. & House) Dearn. & House, Bull. New York State Mus. 266: 73. 1925.

Ascocarps 100–130 μ diam, globose, grouped; wall thin. Asci 33–45 × 9–10.5 μ. Ascospores 12–15 × 3–4 μ, hyaline, fusoid, inequilateral.

On overwintered leaves of *Carex stricta* Lam., eastern North America.

Material examined:

New York: Carey pond, Herkimer Co., 9 Aug 1917, *House* (type, NYS).

Mycosphaerella melanoplaca (Desm.) Lindau, in Engler & Prantl, Natürl. Pflanzenfam. 1(1): 424: 1897.

≡ *Sphaeria melanoplaca* Desm. Ann. Sci. Nat. Bot. III, 18: 364. 1852.
≡ *Sphaerella melanoplaca* (Desm.) Auersw. in Gonnerm. & Rabenh. Mycol. Eur. 5/6: 13. 1869.

Ascocarps 90–150 μ diam, depressed globose, scattered or grouped, with brown connecting hyphae; wall thin. Asci 38.5–50(–55) × 6.5–9 μ. Ascospores 12–18 × 2.5–3.5 μ, hyaline, fusoid, straight or slightly curved.

On overwintered leaves and stalks of *Alchemilla, Geum,* and *Potentilla*, Europe, North America.

Material examined:

Massachusetts: *Barr 3199* (MASS). Michigan: Ann Arbor, 21 May 1925, *Kauffman* (as *Dothidea potentillae,* MICH).

Mycosphaerella campanulae (Ell. & Kell.) Petrak, Hedwigia 65: 227. 1925 (as *Mycosphaerella* Ell. & Kell.).

≡ *Sphaerella campanulae* Ell. & Kell. Amer. Naturalist 17: 1166. 1883.

Ascocarps 104–160 μ diam, globose or slightly depressed, thickly scattered, with connecting brown hyphae; wall thin. Asci 32–48 × 8 μ. Ascospores 11–16 × 3–4 μ,

narrowly obovate fusoid, straight or inequilateral.

On *Campanula* spp., North America, Europe.

Material examined:

Ohio: *Ell. & Ev. N.A.F. 1683.*

Mycosphaerella cruciferarum (Fr.) Lindau in Engler & Prantl, Natürl. Pflanzenfam. 1(1): 424. 1897.

≡ *Sphaeria cruciferarum* Fr., Syst. Mycol. 2: 525. 1823.
≡ *Sphaerella cruciferarum* (Fr.) Sacc. Michelia 2: 315. 1878.
≡ *Carlia cruciferarum* (Fr.) v.Höhnel, Ber. Deut. Bot. Ges. 36: 314. 1918.

Ascocarps (45–)75–120 μ diam, depressed globose, grouped and connected by brown hyphae; wall thin. Asci 36–54 × 9–16 μ. Ascospores 10.5–13.5(–18) × 3–5.5 μ, hyaline, fusoid, straight or curved.

On overwintered stalks of Cruciferae, Europe, North America.

Material examined:

Europe: *Sydow Mycotheca germ. 1231.* Canada: Northwest Territories: Head of Clyde Inlet, Baffin Island, 27 June 1950, *Dansereau* (DAOM, MASS). Quebec: McClelan Strait, 19 July 1955, *Wilce* (DAOM, MASS).

3. Series of *M. ranunculi:* Ascospores large, 15–25(–36) × 2.5–5(–6) μ.

Mycosphaerella ranunculi (Karst.) Lind, Meddel. Grønland 71: 167. 1926. Figures 100–102.

≡ *Sphaerella ranunculi* Karst. Fungi Spetsb. n. 50, 105. 1872.
= *Sphaerella innumerella* Karst. Mycol. Fenn. 2: 182. 1873.
≡ *Mycosphaerella innumerella* (Karst.) Starb. Bih. Kongl. Svenska Vetensk.-Akad. Handl. 15, Afd. III, no. 2: 9. 1889.
= *Sphaerella fusispora* Fuckel, Reis. nach Nordpolarmeer 318. 1874.
= *Sphaerella fusispora* var. *groenlandica* Allescher, Biblioth. Bot. 42: 46. 1897.

Ascocarps 80–150 μ diam, globose or short conic, shining black, scattered to grouped, with brown connecting hyphae; wall relatively thin. Asci 37–67 × (6.5–)11–21 μ. Ascospores 16.5–24(–27) × (2.5–)3–5.5 μ, hyaline, clavate fusoid, inequilateral or slightly curved.

On overwintered leaves and stalks of *Geum, Potentilla, Ranunculus, Cassiope,* widespread in northern regions.

Material examined:

Europe: *Krieger, Fungi sax. 1773; Plowright Sphaer. Brit. 98; Rehm Ascomyceten 2015;* Abisko, Sweden, July 1930, *Lind* (MICH), all as *Sphaerella innumerella.* Northwest Territories: Head of Clyde Inlet, Baffin Island, 1 July and 4 Aug 1950, *Dansereau* (DAOM, MASS). Quebec: McClelan Strait, 20 July 1955, *Wilce* (DAOM, MASS). New Hampshire: *Barr 3855, 3965A, 4095B* (MASS). Oregon: Chimney Lake, Wallowa Co., 21 July 1950, *Kruckeberg* (MASS).

M. ranunculi and *M. taraxaci* are both species of subarctic and subalpine habitats. Both have shining black ascocarps which may be grouped and often connected by brown hyphae, and fusoid elongate ascospores. I differentiate two species on the basis of ascus shape, which is oblong in *M. ranunculi* and broadly oblong approaching saccate in *M. taraxaci.* Ascospores of *M. ranunculi* are relatively narrower than those of *M. taraxaci*; in *M. ranunculi* the ascospores are overlapping biseriate in the ascus whereas in *M. taraxaci* they are more crowded.

Mycosphaerella taraxaci (Karst.) Lind, Rep. Sci. Res. Norwegian Exped. Nov. Zeml. 1921. 19: 11. 1924.

≡ *Sphaerella taraxaci* Karst. Hedwigia 11: 186. 1872.

Ascocarps 80–150 μ diam, globose conic, hypophyllous or epiphyllous, immersed erumpent, rather shining black, scattered thickly or grouped to form black blotches, with brown connecting hyphae in the plant tissues; wall relatively thick (10–17 μ), the cells large and dark brown. Asci (33–)40–56(–72) × 11–20 μ. Ascospores 16–21(–24) × (3.5–)4–5.5(–6) μ, hyaline, clavate fusoid, straight or slightly curved.

On *Taraxacum, Erigeron, Aster, Phyllodoce,* widespread in northern regions.

Material examined:

Europe: Taimyr, July 1843, *Lind* (MICH). Northwest Territories: Ellesmere Island, 5 Aug 1955, *Schuster*; Head of Clyde Inlet, Baffin Island, *Dansereau,* several collections. Quebec: Port Burwell, 30 July 1955, *Wilce* (all DAOM, MASS). British Columbia: *Barr 628,* on *Phyllodoce* (MASS). Washington: *Simmons 2351* (MICH).

Mycosphaerella oenotherae (Ell. & Ev.) Lindau in Engler & Prantl, Natürl. Pflanzenfam. 1: 424. 1897.

≡ *Sphaerella oenotherae* Ell. & Ev. J. Mycol. 1: 151. 1885.
= *Sphaerella granulata* Ell. & Ev. J. Mycol. 2: 102. 1886.
≡ *Mycosphaerella granulata* (Ell. & Ev.) Lindau in Engler & Prantl, Natürl. Pflanzenfam. 1(1): 424. 1897.

Ascocarps 88–175 μ diam, depressed globose, thickly scattered to grouped, with brown connecting hyphae, forming dark blotches at times; wall thin. Asci 35–60(–86) × 8–11 μ. Ascospores 15–25.5 × 2.5–3.5(–5) μ, hyaline, clavate fusoid or narrowly fusoid, straight or curved.

On old capsules and stalks of *Oenothera biennis* L., *Baptisia tinctoria* (L.) R. Br., North America.

Material examined:

New York: Cold Spring Harbor, July 1893, *Johnson* (MICH). New Jersey: *Ell. & Ev. N.A.F. 1681* (*S. oenotherae*), *N.A.F. 1798* (*S. granulata*). Kansas: *Ell. & Ev. N.A.F. 2135* (*S. granulata*).

A second species of *Mycosphaerella* occurs on *Oenothera* capsules in addition to *M. oenotherae.* It is a small species near *M. minor* in subgenus *Didymellina.*

Mycosphaerella punctata Dearn. & House, Circ. New York State Mus. 24: 33. 1940 (without Latin diagnosis).

Ascocarpia 122–138 μ diametro, globoso-conica. Asci 45–72 × 15 μ, bitunicati. Ascosporae 30–36 × 6 μ, fusoideae, hyalinae, inequilaterales vel curvulatae.

In caulibus emortuis *Thalictri polygami,* prope "Newcomb, New York, 11 July 1925," legit *H. D. House*; in herb. New York State Museum depositum.

Ascocarps 122–138 μ diam, globose conic, thickly scattered; wall thin. Asci 45–72 × 15 μ. Ascospores 30–36 × 6 μ, narrowly fusoid, inequilateral or slightly curved.

On overwintered stalks of *Thalictrum polygamum* Muhl., eastern North America.

Material examined:

New York: Newcomb, 11 July 1925, *House* (type, NYS).

Sect. **Longispora** Barr, sect. nov.

In foliis et caulibus emortuis; ascosporae elongato-fusoideae, extremitatibus acutis.

Species typicum: *M. linnaeae* Barr.

Saprobic; ascospores fusoid-elongate, with length:width ratio 6:1 or more.

1. Series of *M. linnaeae:* Ascospores medium-sixed, 16–24 × (1.5–)2–3.5 μ.

Mycosphaerella linnaeae Barr in Bigelow & Barr, Rhodora 68: 187. 1966. Figures 103–104.

This species was described recently (Bigelow & Barr, 1966) from overwintered leaves of *Linnaea borealis* L. var. *americana* (Forbes) Rehd.

Mycosphaerella infuscans (Ell. & Ev.) Barr, comb. nov.

≡ *Sphaerella infuscans* Ell. & Ev. Bull. Torrey Bot. Club 25: 504. 1898.

Ascocarps 64–112 μ diam, globose, thickly scattered, with connecting hyphae forming blackened areas; wall thin. Asci 48–64 × 6.5–8 μ. Ascospores 17.5–21 × 3–3.5 μ, hyaline, fusoid, straight or curved.

On overwintered petioles of *Liriodendron tulipifera* L., North America.

Material examined:

West Virginia: *Ell. & Ev. Fungi Columbiani 1330.*

Mycosphaerella vaccinii (Cooke) Schroet. in Cohn, Kryptogamenfl. Schlesien 3(2): 335. 1894.

≡ *Sphaerella vaccinii* Cooke, J. Bot. 4: 249. 1866.
≡ *Carlia vaccinii* (Cooke) v.Höhnel, Hedwigia 62: 39. 1921.

Ascocarps 56–115 μ diam, globose to conic, hypophyllous, grouped to form dark blotches, with brown connecting hyphae, at times closely grouped and forming stromatic complexes; wall thin. Asci 27–51 × 6–8(–11) μ. Ascospores 16–22.5 × (1.5–)2–3 μ, fusoid, straight or slightly curved.

On overwintered leaves of *Vaccinium* spp., *Andromeda glaucophylla* Link, Europe, North America.

Material examined:

Europe: *Sydow, Mycotheca germ. 1549, 2335; Krieger Fungi Sax. 373.* Northwest Territories: Head of Clyde Inlet, Baffin Island, 24 June and 7 July 1950, *Dansereau* (DAOM, MASS). Newfoundland: Red Bay, 23 June 1954, *Wilce* (DAOM, MASS). Quebec: *Barr 1982* (DAOM, MASS).

2. Series of *M. grossulariae:* Ascospores large, 25–40 × 3–4(–5) μ.

Mycosphaerella grossulariae (Auersw.) Lindau in Engler & Prantl, Natürl. Pflanzenfam. 1(1): 424. 1897.

≡ *Sphaerella grossulariae* Auersw. in Gonnerm. & Rabenh. Mycol. Europ. 5/6: 11. 1869.

Ascocarps 112–144 μ diam, depressed globose, hypophyllous, scattered or loosely grouped; wall thin. Asci 48–72 × 9.5–13(–16) μ. Ascospores 29–40 × 3–4(–5) μ, hyaline, fusoid elongate, straight to curved, in two fascicles in the ascus.

Conidial state: *Septoria ribis* Desm.: Pycnidia globose, hypophyllous or amphigenous; conidia 40–50 × 1–2 μ, filiform, hyaline, 2–3-septate.

Conidial state forming leaf spots; ascal state in overwintered leaves of species of *Ribes,* Europe, North America.

Material examined:

Europe: *Krieger, Fungi sax. 1468; Sydow, Mycotheca germ. 581, 2929.* Ontario: *Fungi Columbiani 4943.*

Sphaeria grossulariae Fries has been considered by some to be this species, but Fuckel (1970), Klebahn (1918), Shear (1943), and Wehmeyer (1961) all agreed that Fries' fungus was a *Pleospora,* considered to be a synonym of *P. herbarum.* The name and authorities cited above are based on Shear's (1943) studies. Stone (1916) and Klebahn (1918) worked out the connection of the *Septoria* with the perfect state; others had earlier noted their association.

Mycosphaerella dolichospora (Sacc. & Fautr.) Wehm. Mycologia 38: 162. 1946.

≡ *Sphaerella dolichospora* Sacc. & Fautr. Rev. Mycol. (Toulouse) 19: 143. 1897.

Ascocarps 128–160 μ diam, depressed globose, grouped and forming blackened areas on stalks, connected by brown hyphae; wall relatively thick. Asci 48–60 ×

14.5–16 μ. Ascospores 25.5–40 × 3(–4) μ, hyaline, fusoid elongate, straight to curved, in two overlapping fascicles in the ascus.

On herbaceous stalks, usually of umbellifers, Europe, North America.

Material examined:

Washington: *Simmons 1405, 1489c* (MICH).

Mycosphaerella alnicola (Peck) Jaap, Ann. Mycol. 15: 105. 1917. Figure 105.

≡ *Sphaerella alnicola* Peck, Annual Rep. New York State Mus. 40: 68. 1887.

Ascocarps 75–120 μ diam, depressed globose, hypophyllous, scattered to grouped; apices erumpent as shining black dots; wall relatively thick. Asci 45–54 × 11–12.5 μ. Ascospores 27–34 × 4–4.5 μ, hyaline, narrowly obovate elongate, straight to slightly curved, in two overlapping fascicles in the ascus.

On overwintered leaves of *Alnus crispa* (Ait.) Pursh, North America, Europe.

Material examined:

New York: Mt. Marcy, June 1886, *Peck* (type, NYS); Lower Ausable, June, *Peck* (NYS).

Jaap (1917) reported this species from Switzerland and transferred the species to *Mycosphaerella* prior to House's combination in Bull. New York State Mus. 233–234: 25. 1920.

Sect. **Plaga** Barr, sect. nov.

In foliis vivis; ascosporae fusoideae, extremitatibus acutis.

Species typicum: *M. colorata* (Peck) House.

Parasitic, the ascocarps developing and maturing in leaf spots in living leaves; spots usually limited by a marginal zone; ascospores fusoid, the ends pointed.

1. Series of *M. prenanthis:* Ascospores 10–12.5 × 2–3.5 μ.

Mycosphaerella prenanthis (Ell. & Ev.) Barr, comb. nov.

≡ *Laestadia prenanthis* Ell. & Ev. J. Mycol. 8: 66. 1902.

Leaf spots light brown, the margin slightly raised; ascocarps 50–80 μ diam, globose or conic or depressed, mostly hypophyllous, scattered; wall thin. Asci 23–27.5 × 8–11 μ. Ascospores 10–12 × 2.5–3.5 μ, hyaline, narrowly obovate fusoid, straight or slightly curved.

On living leaves of *Prenanthes crepidinea* Michx., North America.

Material examined:

Alabama: Tuskegee, Aug 1901, *Carver 925* (type, NY).

Mycosphaerella exutans (Cooke) Barr, comb. nov.

≡ *Sphaerella exutans* Cooke, J. Linn. Soc. Bot. 17: 144. 1880.

Leaf spots 0.5–3 mm wide, blackish with grayish margin and brown beyond the margin into the leaf, or pallid in the center with a black ring, epiphyllous; ascocarps 78–110 μ diam, 90–130 μ high, globose or ovate, mostly epiphyllous, immersed, erumpent and raising flaps of epidermal cells; wall 10–12 μ thick. Asci 35–40 × 9–10 μ. Ascospores 11–13 × 2.5–3 μ, hyaline, narrowly obovate above, tapering to a fusoid base, straight to inequilateral.

On living leaves of *Persea borbonia* (L.) Spreng., North America.

Material examined:

Texas: Galveston Bay, Harris Co., Mar 1869, *Ravenel 46* (isotype, NY).

Cooke described the ascospores as "inaequaliter uniseptatis, hyalinis (.022 × .004 mm.)," quite different from my findings. The ascocarps are described precisely as I found them to be, however, so I must conclude that some error was made in Cooke's

observations on the ascospores. Ascospores of *Pseudomassaria perseae* Hodges and Barr (1971) could have been those of Cooke's brief description. However, no perithecia of the latter fungus were found on the isotype specimen of *S. exutans.*

Mycosphaerella operculata (Sacc.) Barr, comb. nov.

≡ *Sphaerella operculata* Sacc. Nuovo Giorn. Bot. Ital. II. 27: 76. 1920.

Leaf spots dull brown, angular, not distinctly margined; ascocarps uni- or multiloculate, epi- or hypophyllous, 110–140 μ diam or up to 220–275 μ, 110–165 μ high, immersed, erumpent and raising a flap of cuticle and epidermal cells; wall 15 μ thick, with brown hyphae into the leaf tissues. Asci 35–45 × 8–9 μ; locule cells remaining above. Ascospores 10–12.5 × 2.5–3 μ, hyaline, narrowly obovate fusoid, inequilateral or slightly curved.

Microconidial locules present in immature ascocarps.

On living leaves of *Quercus chrysolepis* Liebm., western North America.

Material examined:

California: Cedar Camp Road, California National Forest, 23 June 1928 (Forest Disease Herbarium Berkeley).

This species appears to be a small-spored form closely related to *M. janus.* However, in that fungus the leaf spots are brownish, grayish or whitish and have a reddish brown margin. Sydow and Petrak (1924) suggested that the locule tissue with mature asci warranted transferring *S. operculata* to *Didymella,* but the tissue is not pseudoparaphysate.

2. Series of *M. colorata:* Ascospores (10.5–)12–19 × 1.5–3.5 μ.

Mycosphaerella colorata (Peck) House, Bull. New York State Mus. 233–234: 26. 1921.

≡ *Sphaerella colorata* Peck, Annual Rep. New York State Mus. 29: 62. 1878.

Leaf spots 1–2(–8) mm diam, brown becoming grayish with purplish brown margin on the upper surface, brown and the margin less distinct on the lower surface; ascocarps 75–112 μ diam, globose, scattered or grouped, mostly epiphyllous; wall thin; cells of the apical wall and overlying epidermis vinaceous in water. Asci 32–60 × 6–9.5(–11) μ. Ascospores 12.5–16(–17.5) × 1.5–3 μ, hyaline, fusoid, straight or curved.

On living leaves of *Kalmia angustifolia* L., *K. latifolia* L., North America.

Material examined:

Newfoundland: *Fungi Columbiani 1328.* Nova Scotia: *Fungi Columbiana 3085.* New York: Center (Karner), June, *Peck* (type, NYS). Numerous collections from northeastern North America have been examined.

Mycosphaerella coptis (Schw.) House, Bull. New York State Mus. 233–234: 27. 1921. Figures 90-92.

≡ *Sphaeria coptis* Schw. Trans. Amer. Philos. Soc. II. 4: 224. 1832.
≡ *Sphaerella coptis* (Schw.) Farlow, Appalachia 3: 247. 1884.
≡ *Laestadia coptis* (Schw.) Ell. & Ev. North Amer. Pyrenomyc. 261. 1892.

Leaf spots up to 1 cm diam, gray to grayish white, the margin reddish brown, surrounded by an indefinite brown zone; ascocarps 50–90 μ diam, globose, hypophyllous; wall thin. Asci 29–43 × 7.5–9 μ. Ascospores 10.5–15 × 1.5–3 μ, hyaline, fusoid, straight or slightly curved.

Conidial state: *Septoria coptidis* Berk. & Curt.: Pycnidia 90–165 μ diam, globose or ovoid, epiphyllous in leaf spots; conidia 52–60 × 1.5 μ, hyaline, filiform, curved.

On living leaves of *Coptis groenlandica* (Oeder) Fern., eastern North America.

Material examined:

Quebec: *Barr 1929A, 1975* (DAOM, MASS). Massachusetts: *Ell. & Ev. N.A.F. 2358, 2359.*

Mycosphaerella fragariae (Tul.) Lindau in Engler & Prantl, Natürl. Pflanzenfam. 1(1): 424. 1897.

≡ *Sphaeria fragariae* Tul. Ann. Sci. Nat. Bot. IV. 5: 112. 1856.
≡ *Stigmatea fragariae* (Tul.) Tul. Select. Fungorum Carp. 2: 286. 1863.
≡ *Sphaerella fragariae* (Tul.) Sacc. Michelia 1: 536. 1879.

Leaf spots 1–3 mm diam, grayish brown or whitish, the margin brown or purplish brown; ascocarps 128–160 μ diam, globose or conic, mostly epiphyllous, scattered or grouped; wall thin. Asci 50–70 × 9.5–13 μ. Ascospores 11–14.5 × 3 μ, hyaline, fusoid, straight.

Conidial state: *Ramularia brunnea* Peck: Conidiophores arising in fascicles from subepidermal hyphae or from apex of sterile ascocarps, hyaline; primary conidia sympodiospores, secondary conidia blastospores, forming a chain, hyaline, 14–45 × 2–3 μ, 1 (–3)-septate.

On *Fragaria* spp., cosmopolitan.

Material examined:

Europe: *Krieger Fungi sax. 1359.* North America: Massachusetts: Waltham, 9 Oct 1909, Seymour (MICH). Michigan: Ann Arbor, 27 May 1922, *Kanouse* (MICH). Pennsylvania: *Ellis N.A.F. 1239.* Wisconsin: *Fungi Columbiani 3983.* Wyoming: *Fungi Columbiani 3780.* Washington: *Fungi Columbiani 4486.* Texas: College Station, 23 Feb 1890, *Jennings* (MICH).

This species is usually collected as the conidial state, as in the North American collections cited above.

Mycosphaerella pardalota (Cooke & Ellis) Barr, comb. nov.

≡ *Sphaerella pardalota* Cooke & Ellis, Grevillea 6:16. 1877.

Leaf spots brownish, not margined; ascocarps 80–96 μ diam, globose, amphigenous, thickly grouped; wall thin. Asci 35–48 × 6.5–8 μ. Ascospores 11–17.5 × 3–3.5 μ hyaline, fusoid, straight or slightly curved.

In leaves of *Myrica cerifera* L., eastern North America.

Material examined:

New Jersey: *Ell. & Ev. N.A.F. 2136.*

3. Series of *M. janus:* Ascospores large, (14–)16.5–26.5 × 3–6 μ.

Mycosphaerella janus (Berk. & Curt.) Petrak, Sydowia 11: 340. 1958 ["1957"]. Figure 93.

≡ *Sphaeria janus* Berk. & Curt. Grevillea 4: 154. 1876.
≡ *Leptosphaeria janus* (Berk. & Curt.) Sacc. Syll. Fungorum 2: 85. 1883.
≡ *Metasphaeria janus* (Berk. & Curt.) Berlese, Icon. Fungorum 1: 88. 1894.
≡ *Dothidella janus* (Berk. & Curt.) v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. I, 124: 67. 1915.
= *Sphaerella weiriana* Sacc. Nuovo Giorn. Bot. Ital. II. 12: 76. 1920.
= *Dothidella castanopsidis* Dearn. Mycologia 16: 155. 1924.
≡ *Mycosphaerella castanopsidis* (Dearn.) Petrak, Ann. Mycol. 39: 311. 1941.
= *Dothidella castanicola* Bonar, Mycologia 20: 294. 1928 [as *D. castanicola* (Ell. & Ev.) Bonar].

Leaf spots brown; margin dark reddish brown, raised; ascocarps uni- or occasionally multiloculate, 150–170 μ diam or larger, globose, epiphyllous, scattered singly or in small groups, widely erumpent; wall relatively thick above, with stromatic complexes of hyphae in leaf tissues connecting adjacent ascocarps. Asci 54–72 × 10.5–12 μ.

Ascospores 18–22.5 × 4.6–6 μ, hyaline, elliptic fusoid, tapering more sharply to base than to apex, straight, curved, or bent.

Conidial state: *Asteromella castanicola* (Ell. & Ev.) Petrak: Pycnidia similar to ascocarps; conidia 3–3.5 × 1–1.5 μ, hyaline. Bonar (1928) reported on parallel cultures of single conidia and ascospores: pycnidia were formed in both series of cultures but ascocarps were never formed, despite the utilization of a wide variety of media.

On leaves of *Castanopsis* and *Quercus* spp., southern and western North America. Material examined (pro parte):

Oregon: Star, Lane Co., 22 June 1921, *Boyce 840* (type of *D. castanopsidis*, BPI). California: *Mycobiota of North America 28, 28-A; Calif. Fungi 448, 261, 410, 1023.* Numerous other collections of this fungus exist in herbaria. It has been recorded from Washington, Oregon, California, Nevada, New Mexico, Texas, and Florida (W. B. Cooke 1952).

Petrak (1941, 1958a) discussed the position of the species and brought together much information on its synonymy. Cooke (1952) contributed to details of distribution on various species of *Castanopsis* and *Quercus* as well as to synonymy.

Mycosphaerella glauca (Cooke) Barr, comb. nov.

≡ *Sphaerella glauca* Cooke, Hedwigia 17: 39. 1878.

Leaf spots on upper leaf surface angular, 3–10 mm wide, grayish, the margin dark reddish brown, becoming dull dark brown and blotchy; spots scarcely visible on the lower surface; ascocarps 100–160 μ diam, globose, hypophyllous, at times epiphyllous, scattered to grouped but not united; wall 10–16.5 μ thick; hyphae brown in leaf tissues. Asci 44–80 × 9–14.5 μ. Ascospores 16.5–26.5 × 3–4.5 μ, hyaline, narrowly obovate-fusoid, straight or slightly curved.

On *Magnolia virginiana* L. (syn. *M. glauca*), eastern North America.

Material examined:

New Jersey: *Ellis N.A.F. 800* (as *S. magnoliae* Ellis, n.s.). Florida: *Ellis N.A.F. 1350.*

Cooke described the ascospores of *S. glauca* as "breviter lanceolatis, ...012–.014 × .004 mm," a contradiction of term and sizes. In other respects his brief description fits these collections. It seems reasonable that ".012–.014" was a typographical error for ".022–.024," which would satisfy the term "lanceolate" as well as fall within the size range noted in the collections cited. Tracy and Earle (1896) reported a collection of *S. glauca* with ascospores similar in size to those in my description.

Sphaerella magnoliae Ellis (Bull. Torrey Bot. Club 9: 74. 1881) was described as having ascospores clavate oblong, 7 × 2.5 μ. Ellis' N.A.F. 800 bears in addition to the fungus which I term *M. glauca* a species of *Glomerella* with small ascospores one-celled 9–11 × 2–3.5 μ. This fungus, with collapsing perithecia, is visible under the dissecting microscope as a black ring of wall tissue surrounding a whitish center. It would appear to be identical to *Sphaeria magnoliae* Schw. (Trans. Amer. Philos. Soc. II, 4: 226. 1832), described as ". . . demum collapsis, nigris, sed disco albescente." Schweinitz's specimen is not in his herbarium (Ellis and Everhart 1892). Ellis originally stated that *Sphaerella magnoliae* Ellis was distinct from *Sphaeria magnoliae* Schw., but Ellis and Everhart (1892) combined the two taxa under the name *Laestadia magnoliae* (Schw.) Sacc. Probably the names *Phyllachorella magnoliae* (Schw.) v.Höhnel and *Guignardia magnoliae* (Schw.) Miller also refer to the *Glomerella.*

Mycosphaerella acervata (Ell. & Ev.) Barr, comb. nov. Figures 98-99.

≡ *Diatrype acervata* Ell. & Ev. J. Mycol. 4: 75. 1888.
≡ *Diaporthe acervata* (Ell. & Ev.) Ell. & Ev. North Amer. Pyrenomyc. 738. 1892.

Ascocarps multiloculate, 300–440 μ diam, 165–300 μ high, with brown hyphae around base and sides and into epidermal cells, a few in elliptic gray brown leaf spots,

reddish brown margined, or scattered in older leaves; locules 70–123 μ diam. Asci 28.5–50 × 8–11 μ. Ascospores 14–22 × 3–5 μ, hyaline, elliptic fusoid, inequilateral to slightly curved.

On leaves of *Yucca* spp., North America.

Material examined:

New Jersey: *Ell. & Ev. N.A.F. 2124.* North Dakota: *Brenckle's Fungi Dakot. 438* (as *Kellermannia yuccaegena,* NY). California: Soledad Canyon, 19 May 1935, *Plunke't* (as *Plowrightia circumscissa,* NY).

Wehmeyer (1933) noted that this species was a dothideaceous fungus. Ellis and Everhart (1892) observed "sporidia . . . exactly resembling the sporidia of a *Sphaerella.*"

Subgenus **Didymellina** (v.Höhnel) Barr, stat. nov.

≡ *Didymellina* v.Höhnel, Ann. Mycol. 16: 66. 1918.
≡ *Mycosphaerella* sect. *Didymellina* (v.Höhnel) v.Arx, Sydowia 3: 38. 1949.

Asci saccate, ovoid, or broadly oblong, relatively few in a fascicle, arising from a somewhat arched basal cushion of hyaline cells; ascospores mostly crowded in the ascus. Macroconidial state variable; conidia blastospores.

Section **Didymellina**

Parasitic, often forming spots in leaves.

Type species: *M. iridis* (Desm.) Schroet.

1. Series of *M. polifoliae:* Ascospores small, 10–14(–15) × 2–4.5 μ.

Mycosphaerella polifoliae (Ell. & Ev.) Bubák, Ann. Mycol. 4: 109. 1906. Figures 108–109.

≡ *Sphaerella polifoliae* Ell. & Ev. Proc. Acad. Nat. Sci. Philadelphia 42: 231. 1891 ["1890"].

Leaf spots irregular, extending from tip of leaf inward, grayish brown; ascocarps 60–100 μ diam, globose or conic, epiphyllous; wall thin. Asci 28.5–38.5 × 7.5–10 μ. Ascospores 10–13 × 3–3.5 μ, hyaline, obovate, straight.

On leaves of *Andromeda glaucophylla* Link, North America, Europe.

Material examined:

Ontario: London, Aug 1889 and Sept 1889, *Dearness* (type, NY). New York: Blue Mountain, 23 Aug 1934, *Shear* (as *Venturia gaultheriae,* BPI).

Mycosphaerella sarraceniae (Schw. ex Fr.) P. Henn. Verh. Bot. Vereins Prov. Brandenburg 40: 157. 1898.

≡ *Sphaeria sarraceniae* Schw. ex Fr. Syst. Mycol. 2: 516. 1823.
≡ *Sphaerella sarraceniae* (Schw. ex Fr.) Peck, Annual Rep. New York State Mus. 29: 70. 1878; Sacc. Syll. Fungorum 1: 502. 1882.

Leaf spots large, extending from the tip through much of the leaf, brown at first, soon gray, purplish margined; ascocarps (32–)60–90 μ diam, globose, amphigenous; wall brown, with ample brown hyphae in leaf tissues. Asci (16–)24–35 × (8–)11–14.5 μ. Ascospores (9.5–)11–15 × 3–4.5 μ, hyaline, obovate, straight.

On leaves of *Sarracenia purpurea* L., North America.

Material examined:

Quebec: *Barr 2082* (MASS). Manitoba: "Port Arthur" Winnipeg, 1891, *Dewart* (MICH). Michigan: Ann Arbor, 22 June 1894, *Johnson,* 25 May 1922, *Wehmeyer* (MICH).

A second species of *Mycosphaerella* occurs at times in the leaf spots. It belongs in subgenus *Mycosphaerella,* with scattered ascocarps, oblong asci 32–45 × 6.5–8 μ, and

biseriate, fusoid ascospores 8.5–11 × 2–3 μ. This is the species that Ellis and Everhart (1892) described as *Sphaerella sarraceniae.*

Mycosphaerella thalictri (Ell. & Ev.) Lindau in Engler & Prantl, Natürl. Pflanzenfam. 1(1): 424. 1897.

≡ *Sphaerella thalictri* Ell. & Ev. J. Mycol. 1: 44. 1885.
= *Sphaerella septorioides* Peck, Annual Rep. New York State Mus. 32: 52. 1879, *non S. septorioides* (Desm.) Niessl 1877.
≡ *Sphaerella thalictricola* Sacc. & Syd. Syll. Fungorum 14: 534. 1899.

Leaf spots small, 0.5–4 mm wide, white, the margin reddish brown or brown; ascocarps 64–100 μ diam, globose or depressed, scattered to grouped, hypophyllous but visible through thin tissues on upper surface; wall thin. Asci 27–42 × 8–13 μ. Ascospores 11–14 × 3–4.5 μ, hyaline, obovate with tapered ends, straight or inequilateral.

On leaves of *Thalictrum dioicum* L., *T. polygamum* Muhl., *T. dasycarpum* Fisch. & Lall., North America.

Material examined:

New York: Central Bridge, June 1878, *Peck* (type of *S. septorioides,* NYS); *Bartholomew, Fungi Columbiani 4080.* Wisconsin: *Greene 81, 222* (MICH).

Mycosphaerella ilicis (Ell.) Lindau in Engler & Prantl, Natürl. Pflanzenfam. 1(1): 425. 1897.

≡ *Sphaerella ilicis* Ell. Amer. Naturalist 17: 317. 1883.

Leaf spots 2–5 mm wide or larger by confluence, grayish brown with raised dark brown margin on upper surface, brown below; ascocarps 56–80 μ diam, amphigenous, scattered; wall thin. Asci 19–35 × 9.5–11 μ. Ascospores 11–14 × 2–3.5 μ, hyaline, obovate, straight to inequilateral.

On leaves of *Ilex glabra* (L.) Gray, North America.

Material examined:

New Jersey: *Ellis N.A.F. 1351.*

2. Series of *M. gaultheriae:* Ascospores medium-sized, (9–)13–20 × 3–4.5(–5) μ.

Mycosphaerella gaultheriae (Cooke & Ellis) House, Bull. New York State Mus. 233–234: 27. 1921.

≡ *Sphaerella gaultheriae* Cooke & Ellis, Grevillea 7: 42. 1878. (as *S. gaultheriae* "C. & P." but article by Cooke and Ellis).

Leaf spots 2–10 mm wide, grayish brown with raised purplish margin on upper surface, brown below; ascocarps 72–112 μ diam, globose, mostly epiphyllous, thickly grouped or often forming concentric rings in the spot; wall thin. Asci 35–48 × 8–11(–14.5) μ. Ascospores 9–17.5 × 3–4 μ, hyaline, narrowly obovate, straight.

On leaves of *Gaultheria procumbens* L., *G. shallon* Pursh, North America.

Material examined:

British Columbia: *Barr 1584* (MASS). Massachusetts: *Barr 2447, 3292A* (MASS). New Jersey: *Ellis N.A.F. 799.* California: Noyo, Mendocino Co., 11 July 1937, *Bonar* (MICH).

Mycosphaerella heucherae (Ell. & Ev.) Petrak, Sydowia 11: 240. 1958 ["1957"].

≡ *Dothidella heucherae* Ell. & Ev. Bull. Torrey Bot. Club 27: 571. 1900.

Leaf spots 4–6 mm wide or larger by confluence, dark brown, finally grayish brown, the margin indistinct or darker brown than the spots; ascocarps 50–100 μ diam, globose or conic, amphigenous, thickly scattered to grouped and connected by

brown hyphae; wall thin. Asci 40–45 × 9–11 μ. Ascospores 15.5–18 × 3.5–4.5 μ, hyaline, obovate with tapered ends, straight to inequilateral.

Microconidial state: *Phyllosticta heucherae* Ell. & Ev.: Pycnidia amphigenous in leaf, 80–100 μ diam; conidia 4–6 × 1–1.5 μ, hyaline, oblong, one-celled.

On leaves of *Heuchera cylindrica* Dougl. var. *glabella* (T. & G.) Wheel., western North America.

Material examined:

Idaho: *Idaho Plants 3265* (NY). Washington: Waitsburg, 27 Mar 1900, *Horner* (type, BPI, NY); Spokane, 16 Mar 1921, *Weir* (BPI).

Mycosphaerella cypripedii (Peck) House, Bull. New York State Mus. 233–234: 27. 1921.

≡ *Sphaerella cypripedii* Peck, Annual Rep. New York State Mus. 51: 296. 1899.

Leaf spots brown, marginate; ascocarps 65–115 μ diam, conic, amphigenous, thickly scattered; wall relatively thick, with brown hyphae in leaf tissues. Asci 37–45 × 11–13.5 μ. Ascospores 13.5–17 × 3–4.5 μ, hyaline, obovate, tapered to base, straight.

On leaves of *Cypripedium* sp., eastern North America.

Material examined:

New York: Bay Ridge, Long Island, Oct 1896, *Stewart* (type, NYS).

Mycosphaerella pontederiae (Peck) House, Bull. New York State Mus. 233–234: 29. 1921.

≡ *Sphaerella pontederiae* Peck, Annual Rep. New York State Mus. 40: 69. 1887.
= *Sphaerella paludosa* Ell. & Ev. North Amer. Pyrenomyc. 294. 1892.

Leaf spots 6–10 mm diam, or elongate or confluent and covering much of the leaf, irregular, dark brown, grayish brown below; ascocarps 48–90 μ diam, globose or conic, either hypo- or epiphyllous, with ample brown hyphae connecting and penetrating deep into leaf tissues; wall thin. Asci 31–45 × 13.5–21 μ. Ascospores 13.5–20 × 3–5 μ, hyaline, obovate, straight or inequilateral.

On leaves of *Pontederia cordata* L., *Nuphar* and *Nymphaea* spp., eastern North America.

Material examined:

Ontario: *Ell. & Ev. N.A.F. 2357* (as *S. paludosa*). New York: Whitehall, Sept, *Peck* (type of *S. pontederiae*, NYS). Michigan: Ann Arbor, 18 Sept 1894, *Johnson* (MICH).

3. Series of *M. iridis:* Ascospores large, (12–)15–24 × (3.5–)5–8 μ.

Mycosphaerella iridis (Desm.) Schroet. in Cohn, Kryptogamenfl. Schlesien 3(2): 339. 1894. Figure 106–107.

≡ *Dothidea iridis* Desm. Ann. Sci. Nat. Bot. III, 8: 176. 1847.
≡ *Sphaerella iridis* (Desm.) Auersw. in Gonnerm. & Rabenh. Mycol. Europ. 5/6: 18. 1869.
≡ *Metasphaeria iridis* (Desm.) Sacc. Syll. Fungorum 2: 178. 1883.
≡ *Didymellina iridis* (Desm.) v.Höhnel, Ann. Mycol. 16: 66. 1918.
= *Sacidium desmazierii* Mont. in Desm. Plant. Crypt. France, n. 351. 1856.
≡ *Sphaerella desmazierii* (Mont.) Sacc. Syll. Fungorum 11: 301. 1895.
= *Sphaerella pseudacori* Kirschst. Kryptogamenfl. Mark Brandenburg 7: 402. 1938.

Leaf spots irregular, grayish brown, the margin brown; ascocarps 40–80 μ diam, globose, amphigenous, scattered or grouped; wall thin. Asci 27.5–51 × (12–)16–27 μ. Ascospores 12–22.5 × (3.5–)5–6.5 μ, hyaline, obovate, tapered to base, straight or inequilateral.

Conidial state: *Cladosporium (Heterosporium) gracile* Wallr.: Conidiophores fasciculate, brown, elongating, the scars usually lateral; conidia 25–60 × 12–20 μ,

brown, one-celled at first, soon 1–3–4-septate, oblong or irregular, the wall thick, coarsely echinulate.

On leaves and flowering parts of *Iris* spp., widespread.

Material examined:

Europe: *Krieger, Fungi sax. 2064; Rehm, Ascom. 1763; Sydow, Mycotheca germ. 677, 786, 2329.* North America: Northwest Territories: *Bartlett 3816* (MICH). Newfoundland: Blanc Sablon, 19 July 1957, *Wilce* (MASS). Michigan: Rock River, 22 Aug 1927, *Kanouse* (MICH).

Mycosphaerella allicina (Fr.) Vestergren, Bih. Kongl. Svenska Vetensk.-Akad. Handl. 22, Afd. III, 6: 15. 1896.

≡ *Sphaeria allicina* Fr. Syst. Mycol. 2: 437. 1823.
≡ *Sphaerella allicina* (Fr.) Auersw. in Gonnerm. & Rabenh. Mycol. Europ. 5/6: 19. 1869.

Leaf spots brown, often extending from the tip of the leaf downward; ascocarps 80–104 μ diam, globose or conic; wall relatively thin. Asci 41.5–70 × 16–24 μ. Ascospores 15–24 × 5–8 μ, hyaline, obovate, straight.

On leaves of *Allium* spp., Europe, North America.

Material examined:

Europe: *Briosi & Cavara 307.* North America: Wisconsin: Middleton, Dane Co., 7 July 1944, *Greene* (MICH).

Although *M. allicina* is similar morphologically to *M. tassiana,* and was included as a synonym of that species by von Arx (1949), it must be considered distinct because of its parasitic nature. A number of other names are probably synonymous with *M. allicina.*

Sect. **Cymadothea** (Wolf) v.Arx, Sydowia 3: 37. 1949.

≡ *Cymadothea* Wolf, Mycologia 27: 71. 1935.

Ascocarps usually multiloculate, maturing in overwintered leaves; ascospores obovate; conidial state *Polythrincium,* parasitic and causing conspicuous leaf blotches.

Type species: *M. killianii* Petrak.

Mycosphaerella killianii Petrak, Ann. Mycol. 39: 324. 1941. Figures 110–112.

≡ *Sphaeria trifolii* Pers. ex Fr. Syst. Mycol. 2: 435. 1823, not *M. trifolii* (Karst.) Moesz (1926).
≡ *Dothidea trifolii* (Pers. ex Fr.) Fr. Summa Veget. Scand. 387. 1849.
≡ *Phyllachora trifolii* (Pers. ex Fr.) Fuckel, Symb. Mycol. 218. 1870.
≡ *Plowrightia trifolii* (Pers. ex Fr.) Killian, Rev. Pathol. Vég. Entomol. Agric. France 10: 219. 1923.
≡ *Dothidella trifolii* (Pers. ex Fr.) Bayliss-Elliott & Stansfield, Trans. Brit. Mycol. Soc. 9: 226–7. 1924.
≡ *Cymadothea trifolii* (Pers. ex Fr.) Wolf, Mycologia 27: 71. 1935.

Ascocarps uni- or multiloculate, erumpent, the apex conic; locules ca. 130 μ diam; wall relatively thick. Asci 50–55 × 20–30 μ. Ascospores 22–25 × 6–7.5 μ, hyaline, obovate, straight or inequilateral.

Conidial state: *Polythrincium trifolii* Schmidt & Kunze ex Fr.: Conidiophores arising from a brown stromatic base, erumpent through the lower leaf surface, in fascicles and thickly grouped to form small sooty spots; conidiophores wavy in outline, elongating sympodially, dark brown, 40–50 μ long; conidia 14–17 × 10–12 μ, brown, ovate, truncate at base, one-septate, the wall finely roughened. Microconidial state: *Placosphaeria trifolii* (Pers. ex Fr.) Trav.: Microconidia minute, hyaline, one-celled.

On leaves of *Trifolium* spp., the conidial state and sterile stromata common on living leaves, the perfect state rare after overwintering, cosmopolitan.

Material examined (pro parte):

Switzerland: Kt. Graubünden, Davos, Dischmatal Jatzmäder, 29 May 1964, *Müller,* on *Trifolium alpinum* (BPI, mature ascocarps).

Numerous collections of the conidial state and immature ascocarps have been seen; this fungus is usually collected on living leaves as the *Polythrincium* state.

Much of the synonymy cited above is based on immature ascocarps. Wolf (1935) described development of the various states of the fungus, and erected the genus *Cymadothea* for the species. Petrak (1941) recognized that it was a species of *Mycosphaerella* and provided the necessary new name in transferring *Sphaeria trifolii* to this genus. He also noted that *Phyllachora umbilicata* Theiss. & Sydow, Ann. Mycol. 13: 510. 1915, synonymized with *C. trifolii* by Wolf, is a different fungus.

Sect. **Stigmina** Barr, sect. nov.

Status conidialis *Stigminae,* conidia annellosporae.

Species typicum: *M. stigmina-platani* Wolf.

Ascocarps uniloculate, maturing in overwintered leaves; ascospores obovate; conidial state *Stigmina,* parasitic, causing conspicuous leaf blotches.

Mycosphaerella stigmina-platani Wolf, Mycologia 30: 60. 1938.

Ascocarps 60–80(–96) μ diam, globose, hypophyllous, thickly scattered, often forming blackened areas; wall thin. Asci 25–45 × 8–16 μ. Ascospores 11–15.5 × 3.5–5 μ, hyaline, obovate, straight or inequilateral.

Conidial state: *Stigmina platani* (Fuckel) Sacc.: Conidiophores fasciculate, brown, erumpent through the stomata, elongating and annellate; conidia 15–40 × 7–10 μ, hyaline, soon dark olivaceous brown, oblong elliptic, 1–8-septate; wall thick, dark, coarsely roughened at times. Microconidial state: Pycnidia 55–65 μ diam, hypophyllous; conidia 2–3 × 1 μ, hyaline, oblong.

Conidial state parasitic, perfect state formed in overwintered leaves of *Platanus occidentalis* L., North America, Europe.

Material examined:

North Carolina: Durham, April 1937, *Wolf* (isotype, MICH). Texas: Houston, 8 April 1869, *Ravenel* (as *Sphaeria myriadea,* BPI). Examples of conidial state: *Fungi Columbiani 2885, 4293, 4988.*

The sizes which Wolf (1938) provided in his descriptions of asci and ascospores were larger, 55–70 × 9–11 μ and 17–19 × 6–7 μ respectively, than those I measured in the specimens cited.

Sect. **Tassiana** Barr, sect. nov.

In foliis et caulibus emortuis; ascosporae obovatae, extremitatibus rotundatis.

Species typicum: *M. tassiana* (de Not.) Johans.

Ascocarps saprobic; ascospores obovate.

1. Series of *M. minor:* Ascospores small, (6.5–)9–13(–15) × (2–)3–4.5(–5) μ.

Mycosphaerella minor (Karst.) Johans. Öfver. Förh. Kongl. Vetensk.-Akad. 1884 (9): 165. 1884. Figures 118–120.

≡ *Sphaerella minor* Karst. Mycol. Fenn. 2: 171. 1873.

Ascocarps 22–60(–75) μ diam, globose depressed, occasionally somewhat conic, immersed, in small groups seated on branching radiating brown hyphae; wall thin. Asci (14–)20–30(–37.5) × (8.5–)12–22.5 μ. Ascospores (6.5–)9–13(–15) × 2–4.5 μ, hyaline, obovate, straight.

On overwintered leaves and stalks of various herbs in subalpine and subarctic regions, Europe, North America.

Material examined: see Barr (1959) for numerous collections from Canadian eastern arctic regions.

M. minor is nearly as common as *M. tassiana* on various host plants, both monocots and dicots, in regions of higher latitude and altitude. The small depressed ascocarps grouped on radiating hyphae, and small ascospores, distinguish *M. minor* from *M. tassiana.*

Mycosphaerella borealis (Bubák & Vleugel) Barr, comb. nov.

≡ *Sphaerella (Mycosphaerella) borealis* Bubák & Vleugel, Svensk Bot. Tidskr. 11: 309. 1917.

Ascocarps 45–75 μ diam, globose of conic, immersed, hypophyllous, grouped and forming small grayish irregular spots, with brown hyphae in leaf tissues; wall thin. Asci 22–26.5 × 7.5–9 μ. Ascospores 9–10.5 × 3 μ, hyaline, obovate, straight or inequilateral.

On overwintered leaves of *Alnus* spp., Europe, North America.

Material examined:

New Hampshire: *Barr 3802* (with *Venturia alnea,* MASS). Vermont: *Barr 2986* (MASS).

Mycosphaerella recutita (Fr.) Johans. Öfver. Förh. Kongl. Vetensk.-Akad. 1884(9): 166. 1884.

≡ *Sphaeria recutita* Fr. Syst. Mycol. 2: 524. 1823.
≡ *Sphaerella recutita* (Fr.) Rabenh. in Klotz. Herb. Mycol. n. 659; Bot. Zeitung (Berlin) 16: 80. 1858.
≡ *Carlia recutita* (Fr.) v.Höhnel, Ber. Deutsch. Bot. Ges. 36: 314. 1918.

Ascocarps 37–82 μ diam, globose, immersed, grouped and forming long rows, parallel between leaf veins, or massed into acervulate groups, with brown hyphae connecting the ascocarps and penetrating deep into leaf tissues; wall thin. Asci 19.5–40 × 10–18 μ. Ascospores (8.5–)10–14 × 3–4.5 μ, hyaline, obovate, straight.

On overwintered leaves and stalks of monocotyledons in northern Europe, North America. Barr (1959) listed a number of collections from the Canadian eastern arctic.

Mycosphaerella lycopodii (Peck) House, Bull. New York State Mus. 233–234: 28. 1921.

≡ *Sphaerella lycopodii* Peck, Annual Rep. New York State Mus. 39: 51. 1886.

Ascocarps 30–90 μ diam, globose, immersed, thickly scattered, with brown connecting hyphae; wall thin. Asci 21–39 × 7–13 μ. Ascospores 8–13 × 2.5–3.5(–5) μ, hyaline, obovate, straight.

On overwintered sporophylls of *Lycopodium* spp., North America, Europe.

Material examined:

Northwest Territories: Frobisher Bay, Baffin Island, 1 June 1955, *Wilce* (DAOM, MASS). Quebec: Port Burwell, 17 Aug 1954, *Wilce* (DAOM, MASS). New York: Aden Lair, Essex Co., June, *Peck* (type, NYS). Michigan: *Povah Fp204, 468* (MICH).

2. Series of *M. typhae:* Ascospores medium-sized, (11–)13–16 × 3–5 μ.

Mycosphaerella typhae (Lasch) Lindau in Engler & Prantl, Natürl. Pflanzenfam. 1(1): 425. 1897.

≡ *Sphaeria typhae* Lasch in Klotzsch-Rabenh. Herb. Mycol. n. 660; Bot. Zeitung (Berlin) 3: 67. 1845.
≡ *Sphaerella typhae* (Lasch) Auersw. in Gonnerm. & Rabenh. Mycol. Europ. 5/6: 18. 1869.

Ascocarps (48–)64–80 μ diam, globose to conic, immersed, grouped and often connected at sides, forming long narrow dark streaks in leaf tissue, with brown hyphae connecting and surrounding the ascocarps; wall thin. Asci 28–40 × 10.5–16 μ.

Ascospores 12.5–16 X (3.5–)4–5 μ, hyaline becoming brown in age, obovate, straight or inequilateral.

On leaves of *Typha latifolia* L., Europe, North America.

Material examined:

Europe: *Rabenh.-Klotz. Herb. Mycol. n. 660* (isotype). North America: Michigan: *Barr 1533* (MASS). Pennsyvlania: *Ell. & Ev. N.A.F. 1678.*

Mycosphaerella groveana (Sacc.) v.Arx, the type species of *Scirrhiachora* Theiss. & Syd., occurs on the same host in England. It differs from *M. typhae* in having fusoid ascospores and in forming stromatic ascocarps which contain numerous locules. *M. groveana* would belong in sect. *Fusispora.*

Mycosphaerella chenopodii Dearn. & Barth. in Dearn. Mycologia 16: 157. 1924. Figures 115–117.

Ascocarps 80–130 μ diam, globose or depressed, thickly scattered, with brown connecting hyphae, blackening areas of the stalk; apex conic; wall thin. Asci 33–39 X 12–15 μ. Ascospores 13.5–16.5 X 3–4.5 μ, hyaline, obovate, straight or inequilateral.

On stalks of *Chenopodium leptophyllum* Nutt., North America.

Material examined:

Kansas: Stockton, 11 June 1923, *Bartholomew* (type), 24 July 1923, (both in *Dearness Herb.* in DAOM).

3. Series of *M. tassiana:* Ascospores large, (13–)16–29 X (3–)4.5–8(–9.5) μ.

Mycosphaerella tassiana (de Not.) Johans. Öfver. Förh. Kongl. Vetensk.-Akad. 1884(9): 167. 1884. Figures 113–114.

≡ *Sphaerella tassiana* de Not. Sfer. Ital. 87. 1863.

Ascocarps (64–)70–160 μ diam, conic or globose, immersed, erumpent, scattered to grouped. Asci 38.5–88 X 17–30 μ. Ascospores 16–29 X 4.5–8(–9.5) μ, hyaline, at times brownish and 2–3-septate in age, obovate, straight.

Conidial state: *Cladosporium herbarum:* See de Vries (1952) for description and illustration of this state.

On overwintered leaves and stalks of numerous hosts, both monocotyledons and dicotyledons, throughout subarctic and subalpine regions.

Barr (1959) provided numerous records from the Canadian Eastern Arctic and von Arx (1949) described European collections. This species is extremely common on overwintered plant stalks and leaves in high altitudes and latitudes. It appears to be omnivorous and has been described many times from different hosts. Von Arx (1949) detailed studies of a number of species which he synonymized with *M. tassiana,* and listed many host plants. Barr (1958) detailed the developmental history of this species, and (1959) recognized several varieties of it. The conidial state too has a number of synonyms as shown by de Vries' (1952) study.

Mycosphaerella coerulea (Ell. & Ev.) Tracy & Earle, Pl. Baker. 1: 33. 1901.

≡ *Sphaerella coerulea* Ell. & Ev. Proc. Acad. Nat. Sci. Philadelphia 46: 334. 1895.

Ascocarps 96–160 μ diam, depressed globose (the apex plane), immersed, adhering to the epidermis, shining black, thickly scattered; wall thin. Asci 36–48 X 11–16 μ. Ascospores (13–)16–20 X 4–5 μ, hyaline, narrowly obovate, straight, inequilateral, or slightly curved.

On stalks of *Aquilegia* sp., western North America.

Material examined:

Colorado: *Ell. & Ev. N.A.F. 3522;* above Milner Pass, Rocky Mt. Nat. Park, 22 Aug 1928, *Lohman* (MICH).

Mycosphaerella ludwigii Sydow, Ann. Mycol. 22: 260. 1924.

Ascocarps 60–100 μ diam, globose, shining black, grouped and connected by brown hyphae, forming darkened areas; wall thin. Asci 22–38.5 × 11–12 μ. Ascospores 13–21 × 3–4.5 μ, hyaline, narrowly obovate, straight or inequilateral.

On leaves and stalks of *Epilobium* spp., Europe, North America.

Material examined:

Northwest Territories: *Savile 2682A, 3828A* (DAOM).

Mycosphaerella ascophylli Cotton, Trans. Brit. Mycol. Soc. 3: 96. 1909.

≡ *Sphaerella ascophylli* (Cotton) Sacc. & Trotter, Syll. Fungorum 22: 147. 1913.

Ascocarps 72–160 μ diam, globose or conic, immersed; wall thin, light brown, the erumpent portion blackened. Asci 56–64 × 16–19 μ. Ascospores 14.5–22.5 × 5–6.5 μ, hyaline, elliptic obovate, straight.

In receptacles of *Ascophyllum nodosum* (L.) Le Jolis, Europe, North America.

Material examined:

Maine: Kittery Point, 24 May 1908, *Thaxter, Reliq. Farlowianae 82* (MICH).

Sect. **Fusispora** Barr, sect. nov.

In foliis et caulibus emortuis; ascosporae fusoideae, extremitatibus acutis.

Species typicum: *M. lineolata* (Rob. in Desm.) Schroet.

Ascocarps saprobic; ascospores fusoid, the ends pointed.

1. Series of *M. sphaerellula:* Ascospores medium-sized, 13.5–16 × 3–3.5 μ.

Mycosphaerella sphaerellula (Peck) Barr, comb. nov. Figures 123-124.

≡ *Sphaeria sphaerellula* Peck, Annual Rep. New York State Mus. 30: 66. 1878.
≡ *Didymella sphaerellula* (Peck) Sacc. Syll. Fungorum 1: 547. 1882.

Ascocarps 75–97 μ diam, globose conic, immersed and raising epidermis, connected and forming long lines with brown hyphae, the apices finally erumpent in small groups; wall relatively thin. Asci 27–50 × 9–12.5 μ. Ascospores 13.5–16 × 3–3.5 μ, hyaline, obovate fusoid, straight or inequilateral.

On thin twigs of *Acer pensylvanicum* L., eastern North America.

Material examined:

New York: Phoenicia, June 1876, *Peck* (type, NYS).

2. Series of *M. lineolata:* Ascospores large, (10.5–)15–24 × (2.5–)3–4.5(–5.5) μ.

Mycosphaerella lineolata (Rob. in Desm.) Schroet. in Cohn, Kryptogamenfl. Schlesien 3(2): 339. 1894. Figures 121–122.

≡ *Sphaeria lineolata* Rob. in Desm. Ann. Sci. Nat. Bot. II, 19: 351. 1843.
≡ *Sphaerella lineolata* (Rob. in Desm.) Ces. & de Not. Comment. Soc. Crittog. Ital. 1(4): 237. 1863.

Ascocarps 32–90(–105) μ diam, globose, conic, or slightly depressed, loosely or closely grouped, with brown connecting hyphae forming elongate grayish areas; wall thin. Asci 21–51 × 9.5–22 μ. Ascospores (12–)14–24 × 3–4.5(–5.5) μ, hyaline, fusoid or obovate fusoid, straight to inequilateral.

On overwintered leaves of *Carex* and *Juncus* spp., Europe, North America.

Barr (1959) published data on a number of collections of this species from the Canadian Eastern Arctic.

Mycosphaerella perexigua (Karst.) Johans. Öfver. Förh. Kongl. Vetensk.-Akad. 1884(9): 166. 1884.

≡ *Sphaerella perexigua* Karst. Hedwigia 11: 187. 1872.
= *Mycosphaerella perexigua* var. *minima* Johans. Öfver. Forh. Kongl. Vetensk.-Akad. 1884(9): 166. 1884.
≡ *Sphaerella perexigua* var. *minima* (Johans.) Berl. & Vogl. Addit. Syll. Fungorum 83. 1886; Syll. Fungorum 9: 653. 1891.

Ascocarps 32–75 μ diam, globose, scattered, with light brown connecting hyphae; wall thin. Asci 19–35 × 10.5–18 μ. Ascospores 10.5–22.5 × 2.5–3.5(–4.5) μ, hyaline, fusoid, straight or slightly curved.

On overwintered leaves of *Juncus, Luzula, Scirpus, Eriophorum* spp., Europe, North America.

Material examined:

Europe: Abisko, July 1930, *Lind* (MICH). North America: Northwest Territories: Head of Clyde Inlet, Baffin Island, 1 July, 8 July, 4 Aug 1950, *Dansereau* (DAOM, MASS). Newfoundland: Hebron, 30 July 1954, *Wilce* (DAOM, MASS). Quebec: Port Burwell, 17 Aug 1954, *Wilce* (DAOM, MASS).

Mycosphaerella capronii (Sacc.) Lind, Skr. Vidensk.-Selsk. Christiana, Math.-naturvidensk. Kl. 1909, no. 9: 16. 1910.

≡ *Sphaerella capronii* Sacc. Syll. Fungorum 1: 487. 1882.

Ascocarps globose, 66–115 μ diam, thickly grouped, hypophyllous; wall thin. Asci 30–48 × 10.5–13.5 μ. Ascospores 15.5–19.5(–21) × 3–4.5 μ, hyaline, fusoid, inequilateral or slightly curved.

On overwintered leaves of *Salix* spp., Europe, North America.

Material examined:

Newfoundland: Red Bay, Labrador, 23 June 1954, *Wilce* (DAOM, MASS).

Sphaerulina Sacc. Michelia 1: 399. 1878.

= *Ophiocarpella* Theiss. & Syd. Ann. Mycol. 13: 645. 1915.

Ascocarps usually uniloculate, scattered, grouped, or closely connected by brown hyphae, at times multiloculate, globose or conic, immersed or erumpent, opening by small apical pore; wall relatively thin, of two to five layers of brown polygonal cells, the cells thin- or thick-walled, usually forming *textura angularis,* the hyphae in host tissues brown, broad and short-celled. Asci oblong or clavate, bitunicate, in a fascicle from a low basal cushion; base footlike or rounded and sessile. Ascospores hyaline, minutely guttulate, in one, two or three overlapping fascicles in the ascus, cylindric filiform, straight or curved (the ends rounded), several-septate, not constricted at septa; wall thin, smooth.

Conidial state where known; *Septoria* (as *Cylindrosporium* or *Phleospora*): Pycnidia formed in spotted areas of living leaves, immersed-erumpent, the wall thin, often incomplete toward apex, opening widely at maturity; conidiophores as short hyaline cells lining locule; conidia hyaline, cylindric, usually curved, several-septate. Microconidial state *Asteromella*-like.

Parasitic or saprobic in leaves of woody dicotyledons.

Saccardo erected *Sphaerulina* for species similar to *Mycosphaerella* in ascocarp and asci, but with ascospores elongate and several-septate. He noted that *Sphaerulina* differed from *Leptosphaeria* section *Leptosphaerella* Sacc. in lacking pseudoparaphyses, in having hyaline ascospores, and in the sphaerellaceous habit. *S. myriadea* was the first species named in *Sphaerulina,* and this species agrees entirely with the original concept of the genus. Unfortunately, Saccardo also included *S. (Pringsheimia) intermixta* (Berk. & Br.) Sacc. in his concept of the genus, and some authors have taken this species to

typify *Sphaerulina,* especially since Winter (1887) illustrated the genus by this species. This name is a synonym of *Saccothecium sepincola* (Fr.) Fr. according to most authors. Wehmeyer (1957) discussed *Sphaeria intermixta* Berk. & Br., and considered the name to be a *nomen dubium.*

The species of *Sphaerulina* could be derived from those of *Mycosphaerella* subg. *Mycosphaerella* which I group in section *Longispora.* In these the ascospores are elongate, narrow, and taper to the ends. Longer and narrower ascospores with more septa characterize the species of *Sphaerulina.* Within this genus two series of species are evident: those which mature in overwintered leaves (but which may form leaf spots or blotches in the conidial or primordial state), and those which mature in living leaves. The ascocarps in all species are frequently grouped and in some collections they may be connected by abundant hyphae to form a stromatic complex. The most stromatic of these species, *S. tarda,* was the basis for the name *Ophiocarpella* Theiss. & Syd.

Kirschstein (1938) referred *Ophiosphaerella* Speg. to synonymy with *Sphaerulina.* I cannot pass judgment on the validity of this disposition at the present time.

Lectotype species: *S. myriadea* (DC. ex Fr.) Sacc.

1. Series of *S. myriadea:* Ascocarps maturing in dead overwintered leaves.

Sphaerulina myriadea (DC. ex Fr.) Sacc. Michelia 1: 399. 1878.

≡ *Sphaeria myriadea* DC. ex Fr. Syst. Mycol. 2: 524. 1823.
≡ *Sphaerella myriadea* (DC. ex Fr.) Auersw. in Gonnerm. & Rabenh. Mycol. Europ. 5/6: 9. 1869.
= *Sphaeria serograpta* Dur. & Mont. Flore d'Algerie 1: 537. 1846–49.
≡ *Sphaerella serograpta* (Dur. & Mont.) Auersw. in Gonnerm. & Rabenh. Mycol. Europ. 5/6: 12. 1869.
≡ *Sphaerulina serograpta* (Dur. & Mont.) Sacc. Syll. Fungorum 2: 187. 1883.
= *Sphaerulina myriadea* var. *viburni* Sacc. Syll. Fungorum 2: 186. 1883.
≡ *Sphaerella septorispora* Sacc. Ann. Mycol. 12: 287. 1914.
≡ *Mycosphaerella septorispora* (Sacc.) Petrak, Flor. Bohem. Morav. exs. II, Ser. 1 Abt. Pilz, no. 1026. 1914.

Ascocarps 90–150 μ diam, scattered to grouped in dull grayish blotches in overwintered leaves, epi- or hypophyllous. Asci 50–65 × 8–12 μ. Ascospores 25–32.5 × 2–3(–4) μ, 3-septate, in two overlapping fascicles in the ascus.

In leaves of *Quercus* and *Fagus* spp., Europe, Asia, North America.

Material examined:

Europe: *Krieger, Fungi sax. 279; Allescher & Schnabl, Fungi bavarici 441, 540, 541; Petrak, Flora moravica,* Mähr-Weisskirchen, 1915, *Myc. carpatica 67, Fungi polonici exs. 267, Fl. Bohem. et Morav. exs. 1026; Thümen, Fungi aust. 468; Herb. Barbey-Boissier 503; Thümen, Myc. univ. 2157.* North America: South Carolina: *Ravenel Fungi Amer. exs. 156.* (immature). Maryland: Marlboro, 26 Apr 1929, *Shear.* California: Hoberg's Resort, Lake Co., 15 May 1943, *Miller* (all BPI).

In the European collections examined the ascocarps are erumpent through the upper leaf epidermis, whereas in the North American material they are erumpent through the lower epidermis. All other characters are in agreement.

Sphaerulina tarda (Harkn.) Barr, comb. nov. Figures 125–126.

≡ *Ophiodothis tarda* Harkn. Bull. Calif. Acad. Sci. 1: 46. 1884.
≡ *Ophiodothella tarda* (Harkn.) v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. I, 119: 941. 1910.
≡ *Ophiocarpella tarda* (Harkn.) Theiss. & Syd. Ann. Mycol. 13: 645. 1915.

Ascocarps 60–150 μ diam, closely grouped and connected by brown hyphae to form circular or irregular stromatic masses 1–2 mm diam, chiefly hypophyllous; wall 11–17.5 μ thick. Asci 44–60 × 7.5–11 μ. Ascospores 35–50 × 1.5–3 μ, (1–2–)3-septate, in one fascicle in the ascus.

In overwintered leaves of *Rhus diversiloba* T. & G., western North America.

Material examined:

California: Golden Gate Park, San Francisco, March 1882, *Harkness* (type, CAS); San Francisco, Jan 1884 (NY); *Ell. & Ev. N.A.F. 1585.*

Sphaerulina rubi Demaree & Wilcox, Phytopathology 33: 997. 1943.

Ascocarps 70–130 μ diam, 88–140 μ high, globose or conic, scattered singly or grouped and forming small blackened patches, erumpent either epi- or hypophyllously, often connected in a thin stromatic crust by brown hyphae; wall up to 20–25 μ thick. Asci 45–60(–70) × 8–10(–15) μ. Ascospores 23–30 × 2.5–3.5 μ, 3 (–5–7)-septate, in two overlapping fascicles in the ascus.

Conidial state: *Septoria* (*Cylindrosporium rubi* Ell. & Morgan): Pycnidia developing in small angular spots in living leaves; spots brown, red margined; pycnidia 58–121 μ diam, 50–104 μ high, epi- or hypophyllous; wall thin, 12–15 μ thick; conidiophores arising from the inner wall surface as short cells 5 × 7.5 μ; conidia 32–86 × 2–5 μ, hyaline, cylindric, usually curved, 3–9-septate.

On leaves of *Rubus* spp., the conidial state widespread in living leaves, the ascal state known from North America, Europe.

Material examined (pro parte):

North America: Maryland: Beltsville, 7 May 1940, *Demaree* and *Wilcox* (type); 5 May 1940, *Demaree* (both BPI). Europe: Königstein, Germany, May 1897, *Krieger* (as *S. myriadea, S. rubi* Krieg. n.sp.?, PBI).

Specimens of the conidial state have been examined from Massachusetts, New York, Michigan, Washington, Ohio, Illinois, Oregon, North Carolina, Maryland, and Missouri.

Demaree and Wilcox (1943) established the connection between the conidial and ascal states of *S. rubi.* The type specimen bears small pycnidia interspersed with the ascocarps, as well as the overwintered *Septoria* state. The microconidial pycnidia are 50–60 μ diameter, hypophyllous, and contain minute hyaline microconidia.

The related *Sphaerulina rehmiana* Jaap develops on leaves of *Rosa* in Europe. Klebahn (1918) described the development of this fungus; included in the life cycle are microconidial and macroconidial states. Klebahn compared a number of collections and decided that the conidial state was *Septoria rosae* Desm. [*Phleospora rosae* (Desm.) v.Höhnel] .

2. Series of *S. conflicta:* Ascocarps maturing in spots in living leaves.

Sphaerulina conflicta (Cooke) Barr, comb. nov. Figures 127–129.

≡ *Sphaeria conflicta* Cooke, Grevillea 7: 13. 1878.
≡ *Linospora conflicta* (Cooke) Sacc. Syll. Fungorum 2: 355. 1883.

Ascocarps developing in spots in living leaves; spots visible on both leaf surfaces, brown or grayish brown, with reddish brown margins, circular or irregular in shape, ca. 5 mm diam, or connected and covering much of the leaf; ascocarps 140–170 μ diam, thickly scattered, globose, conic, or ovoid, erumpent epiphyllously, raising small flaps of epidermis, often lying obliquely in leaf tissues; wall 13–16.5 μ thick, up to 27.5 μ toward apex. Asci 75–96 × 11–13 μ. Ascospores 35–45 × 2–3 μ, 3 (–5)-septate, in two overlapping fascicles in the ascus.

On leaves of *Lithocarpus densiflora* (H. & A.) Rehd., western North America.

Material examined:

California: *Ell. & Ev. N.A.F. 1670; Fungi Columbiani 421; Rabenh.-Wint. Fungi eur. 3759*; Tamalpais, Streetens, *Harkness;* Mount Tamalpais, 1893, *Blasdale;* Mill Valley, 23 May 1893, *Blasdale;* Cazadiro, May 1894, *Bioletti* (all NY); Ross Valley, Marin Co., 11 Aug 1893, *Blasdale* (DAOM 18377).

Sphaerulina bonariana Petrak, Sydowia 15: 209. 1962 ["1961"].

Ascocarps 165–190 μ diam, 220–275 μ high, ovoid, grouped, widely erumpent epiphyllously, connected at the lower sides and forming groups up to 1 mm diam; surrounding leaf tissue dull brown or reddish brown as a narrow band around groups, occasionally included in large indeterminate or red-margined spots, usually raised into grayish brown flaps of epidermal cells over the groups; wall 18–25 μ thick. Asci 80–90 × 12–14 μ. Ascospores 32–45 × 3–4 μ, 3-septate, in two or three overlapping fascicles in the ascus.

On living leaves of *Castanopsis sempervirens* (Kell.) Dudl., western North America.

Material examined:

California: shore of Bear Lake, Plumas Co., 1 Aug 1942, *Bonas*; Alta Peak trail, Grant Forest, Sequoia Nat. Park, Tulare Co., 29 July 1945, *Bonar* (as *Calif. Fungi 725* and *726*, as *S. myriadea*, isotypes, BPI, NY; holotypes UC); Tulare Co., 18 June 1931; Sequoia Nat. Park, 18 June 1931, *Parks* (BPI).

Sphaerulina naumovii Vassiljeva, Bot. Mater. Otd. Sporov. Rast. Bot. Inst. Komarova Akad. Nauk SSSR 8: 94. 1952. Figures 130–131.

Ascocarps 82–115 μ diam, globose, few scattered and erumpent through either leaf surface, in brown leaves or brown tip portions of leaves in living branches, with brown connecting hyphae; wall 12–15 μ thick. Asci 39–60 × 12–15 μ. Ascospores 30–37.5 × 3–4 μ, 3–5-septate, in one fascicle in the ascus.

On *Cassiope hypnoides* (L.) D. Don, North America, Europe.

Material examined:

Europe: Jahkatsch, Lapponia enontekiensis, Finland, 31 July 1932, *Montell* (MASS). North America: New Hampshire: Mt. Washington, 25 June 1880, *Brown* (MASS).

I have not seen the original description of *S. naumovii*, but have grouped the above collections under that name because of similarities in host plants.

Dothidea Fr. Syst. Mycol. 2: 548. 1823, emend.

= *Systremma* Theiss. & Sydow, Ann. Mycol. 13: 330. 1915.
= *?Phragmodothis* Theiss. & Sydow, Ann. Mycol. 12: 179. 1914.

Ascocarps multiloculate, immersed at first, becoming erumpent, globose, pulvinate or irregular, composed of vertically oriented rows of polygonal cells forming *textura angularis*, blackened externally, brown to hyaline internally; cells mostly thick-walled with pit or pore connecting adjacent cells; locules immersed or partially erumpent; wall scarcely distinct from surrounding tissue or narrow and composed of few layers of cells, opening by a small apical pore in the short papillate apex. Asci arising in a fascicle from a basal cushion, oblong or clavate, bitunicate, very short stipitate or sessile, the ascospores eight or fewer. Ascospores overlapping biseriate (uniseriate when fewer than eight) in the ascus, hyaline at first, soon yellowish brown or dark brown, obovate elliptic, one-septate, constricted at the septum; wall usually finely roughened at maturity; globule one in each cell.

Conidial state: Conidia budding from cells of young stromata, from hyphae or from ascospores. In culture the hyphae form blackish gelatinous crusts, *Aureobasidium pullulans*-like. Microconidial locules have also been observed (Luttrell 1951a).

Usually saprobic, weakly parasitic at times, on branches or rarely leaves of woody plants, gymnosperms and dicotyledons, or on larger monocotyledons, widespread.

Consistency in minimizing the importance of stromatic development as a generic character requires a narrowed concept of *Dothidea*. The species I have retained in the genus are linked together by ascospore characters: broadly obovate elliptic in shape, brown at maturity, each cell containing a single globule, the wall usually roughened at maturity. Another characteristic possessed by this group of species is that of pores in the cell walls in the interior of young ascocarps, described by Luttrell (1951a) and

Loeffler (1957). That these species all form multiloculate ascocarps is a characteristic of lesser importance which may be found in a number of species belonging to other genera in the Dothideaceae. As an example, the formation of stromatic tissues and multiloculate ascocarps was not considered to be generically important when Petrak (1958a) transferred *Dothidella heucherae* and *D. janus* to *Mycosphaerella.*

There has been some conflict of opinion as to the type species of *Dothidea.* Fries (1823) did not designate a type species. Saccardo (1883) designated *D. sambuci* Fr. as type of the name. He limited *Dothidea* to brown-spored species and erected *Plowrightia* for hyaline-spored species. *D. sambuci* was generally accepted as typifying *Dothidea,* but Theissen and Sydow (1915) argued that *D. moriformis* Ach. ex Fr., the first species listed by Fries under *Dothidea* in 1823, should typify *Dothidea,* and they therefore erected *Systremma* based on *D. sambuci.* Since *D. moriformis* was considered by Fries (1828) only as a member of the "Dothideoideae," and was the basis for the genus *Kullhemia* Karst. 1878, it can scarcely be designated as the type species of *Dothidea. D. sambuci,* as one of the original species listed by Fries, and following customary usage ever since Saccardo in 1883, is the logical lectotype. *D. ribesia,* the type of *Plowrightia* Sacc., is again removed from *Dothidea* in the present interpretation of that genus. *Dothidella* sensu Theissen and Sydow (1915) has been used to accommodate hyaline-spored species, but von Arx (1958) showed *Dothidella* to be a microthyriaceous genus.

From Loeffler's (1957) arrangement of the species of *Dothidea* the hyaline-spored species are transferred to other genera. *D. muelleri* Loeffler is pleosporaceous in locule structure and related to *Scirrhodothis,* according to authentic Swiss material kindly communicated by Dr. Müller. *D. ribesia* Fr. and *D. insculpta* Wallr., both known from North America as well as from Europe, are members of the Dothioraceae, the former in *Dothiora,* the latter in *Scirrhia.* According to descriptions and figures of the other European species which Loeffler recognized in *Dothidea*–*D. mezerei* Fr., *D. berberidis* (Wahl.) de Not., and *D. hippophäeos* (Pass.) Fuckel–these too would be better placed in the Dothioraceae than in *Dothidea. D. concaviuscula* Ell. & Ev. also is removed from *Dothidea* to *Scirrhia,* while *D. parryi* Farlow from tropical America seems to be a species of *Mycosphaerella.*

Lectotype species: *D. sambuci* Fr.

Dothidea sambuci Fr. Syst. Mycol. 2: 551. 1823. Figures 132–134.

Loeffler (1957) provided an extensive synonymy of this species.

Ascocarps variable in size and shape. Asci 36–60 × (10–)13–24 μ, 8-spored. Ascospores 13–34 × (5.5–)7–11 μ, brown, broadly elliptic.

On numerous woody dicotyledons, Europe, North America; weakly parasitic on leaves as well as branches of *Garrya* spp., North America.

Material examined (pro parte):

California: *Calif. Fungi 1146* (NY); Berkeley, *Harkness* (on specimen of *Sphaeria garryae* Cke., NY).

Dothidea puccinioides Fr. Syst. Mycol. 2: 551. 1823. Figures 135–136.

Loeffler (1957) provided synonymy of this species. *Dothidea calystegiae* Cooke & Harkn. Grevillea 13: 8. 1884, is probably an additional synonym. The type specimen is immature but ascocarps and young locules are identical with other specimens of *D. puccinioides.*

Ascocarps variable in size. Asci 48–60 × 12–15 μ, the spores 4 or fewer. Ascospores (14.5–)18–34 × (6–)8–14 μ, brown, broadly elliptic.

On numerous woody dicotyledons, Europe, North America.

Material examined (pro parte):

California: *Harkness 2477* (type of *D. calystegiae,* CAS). New Jersey: *Ellis N.A.F. 168a, 168b; Ell. & Ev. Fungi Columbiani 1331.*

Dothidea conspicua Griff. Bull. Torrey Bot. Club 26: 442. 1899.

≡ *Phragmodothis conspicua* (Griff.) Theiss. & Syd. Ann. Mycol. 12: 179. 1914.

= *Dothidea yuccae* Earle, Bull. New York Bot. Gard. 2: 346. 1902 (Apr), *non Phyllachora yuccae* Ell. & Ev.

= *Dothidea yuccae* Ell. & Ev. J. Mycol. 8: 19. 1902 (May), *non Phyllachora yuccae* Ell. & Ev.

≡ *Phaeodothis yuccae* (Ell. & Ev.) Sacc. Syll. Fungorum 17: 855. 1905.

≡ *?Systremma yuccae* (Ell. & Ev.) Theiss. & Syd. Ann. Mycol. 13: 337. 1915.

Ascocarps immersed erumpent, rounded or elongate, 250–500 μ diam or up to 1100 μ long, 200–275 μ high; locules 50–143 μ diam, 70–150 μ high. Asci 55–70(–80) × 12–16(–22) μ, 8-spored. Ascospores 13–21 × (5–)6–8.5 μ, dull yellowish brown or dark brown, broadly obovate, slightly constricted at the septum; wall finely roughened.

On dead leaves of *Yucca* spp., western North America.

Material examined:

Montana: Billings, Aug 1898, *Griffiths, West Amer. Fungi 43* (isotype of *D. conspicua*). Wyoming: *Mycoflora Saximont. Exs. 126* as *Didymosphaeria clementsii* (NY, with *Venturia weiriana*). Colorado: Manitou, July 1895 (NY, basis for *Dothidea yuccae* Ell. & Ev.). California: Soledad Canyon, 19 May 1935, *Plunkett* (NY, as *Plowrightia circumscissa*); Stanford Univ., 20 Oct 1901, *Baker* (NY, basis for *Dothidea yuccae* Earle); Mts. near Claremont, 12 Mar 1911, *Baker* and *Metz* (NY, as *Phaeodothis yuccae*).

The names *Dothidea yuccae* Earle and *D. yuccae* Ell. & Ev. were both based on the assumption that *Phyllachora yuccae* Ell. & Ev. Bull. Torrey Bot. Club 22: 440. 1895, was the same fungus in immature condition. Type material of the latter (Matamoros, Mexico, June 1895, *Egeling,* NY) is rather immature *Kellermania anomala* (Cooke) v.Höhnel. The "asci" of the original description are the elongate conidia of the *Kellermania,* some sufficiently matured to have a septum and the typical apical appendage.

Theissen and Sydow (1914) erected *Phragmodothis* on the basis of *Dothidea conspicua* Griffiths and described biseriate, blackish brown, 3-septate ascospores 20–24 × 5–6 μ. Neither the collections cited above nor any of the numerous other specimens of *Yucca* which I have examined bore any fungus fitting the description of *Phragmodothis.* The nearest possibility is a species of *Karstenula* found on Solheim's *Mycoflora Saximont. exs. 126,* but that fungus has separate ascocarps, cylindric asci containing uniseriate ascospores which have three transverse septa and a vertical septum through the mid cells.

Petrak (1929) described another fungus he found on the substrate of *Kellermania yuccaegena* (Brenckle, *Fungi Dakotensis 438*), which had locules in an erumpent stroma, cylindric asci, blackish brown, three-septate ascospores 16–20(–24) × 5–6.5 μ. He concluded that it was identical with *Phragmodothis conspicua* Theiss. & Syd., and that it was a species of *Cucurbitaria,* and he transferred it to *Thyridaria.* He then reduced *Phragmodothis* to a synonym of *Thyridaria.* Wehmeyer (1941) did not accept that species in *Thyridaria,* because he too found *Dothidea conspicua* to be dothideaceous. The specimens of Brenckle's *Fungi Dakot. 438* which I have examined (from BPI and NY) bear *Kellermania anomala, Coniothyrium* sp., and *Mycosphaerella acervata.* Petrak later (1941) discussed *Plowrightia circumscissa* Tracy & Earle, which Theissen and Sydow (1915) had transferred to *Phragmodothis.* Petrak reported that the hyaline, one-septate ascospores described by Tracy and Earle were immature; at maturity the spores were biseriate, olive-brown, 3-septate, 18–20 × 5–6 μ. He included *P. circumscissa* in the synonymy of *Thyridaria conspicua,* with the host plant *Yucca gloriosa.* The only specimen bearing the name of *P. circumscissa* which I obtained from NY (*Plunkett,* California, see above) has spots containing *Mycosphaerella acervata,* and non-spotted dead areas of leaves containing *D. conspicua.* Holm (1968) found *Dothidea conspicua* to be as Griffiths described it. He suggested that Theissen and Sydow confused two species in describing *Phragmodothis,* as I too believe must have happened.

Holm also suggested that *Phaeosphaerella weiriana* Petrak [*Venturia weiriana* (Petrak) Barr] might be a uniloculate form of *D. conspicua.* However, there are discrete differences between the two fungi, which often occur on the same dead leaves. *V. weiriana* has separate ascocarps which may be grouped in the leaf, are often depressed and remain immersed. Sparse delicate pseudoparaphyses are interspersed between asci in the locule. Asci and ascospores are quite similar in size and shape in the two species, although in *V. weiriana* the ascospores tend always to be smaller (10–12 × 4.5–5.5 μ), than they are in *D. conspicua.*

Dothidea acerva Barr, sp. nov. Figures 137–140.

Ascocarpia 350–650 μ diametro, 150–220 μ alta, erumpentia; hypostroma in contextu hospitis; loculi 40–60 μ diametro infra paginam stromae. Asci 22–27.5 × 9–11 μ, oblongi vel saccati, bitunicati. Ascosporae 6.5–9 × 2–4 μ, viridi-hyalinae vel fuscae, ellipticae vel obovatae, uniseptatae.

Specimen typicum in foliis, ramulis, et amentis pistillatis *Juniperi communis,* prope "Conway, Massachusetts, 22 May 1966" a *M. E. Barr* n. *4821* lectum, in Herb. Univ. Mass. depositum.

Ascocarps multiloculate, pulvinate, 350–650 μ diam, 150–220 μ high, erumpent from the host tissue, brown; hypostroma in host tissues; locules over the surface, 40–60 μ diam, globose to conic; wall of two to three layers of polygonal blackish brown cells, 9–11 μ thick, merging at base with stromatic tissue in upright rows of polygonal cells; apex short papillate or nearly plane, opening by a small pore. Asci 22–27.5 × 9–11 μ, oblong or saccate. Ascospores 6.5–9 × 2–4 μ, greenish hyaline becoming brown, elliptic or obovate, the ends broadly rounded; septum median or slightly submedian, constricted; wall very finely roughened at maturity; globule solitary in each cell or the contents homogeneous.

On dead leaves, branches and pistillate aments of *Juniperus communis* L., eastern North America.

Material examined:

New Hampshire: *Barr 4027* (MASS). Massachusetts: *Barr 2690, 4813, 4821* (type) (MASS).

The Massachusetts collections were all made from a single large plant. None of the nearby shrubs bore the fungus. The species grew rapidly in culture, particularly on malt agar, to form a moist black colony. In the colony numerous stromatic masses developed and budding hyaline conidia were produced on their surface. The growth habit is similar to that of *Aureobasidium pullulans.* No ascocarps were formed in culture. The conidial state as formed in culture appears close to that produced by *Kabatina juniperi* (Schneider & von Arx 1966). The latter fungus forms erumpent acervuli on branches of *Juniperus* in Europe. No such acervuli were found on the North American collections.

Attempts to identify this species with others previously described from *Juniperus* were unsuccessful. *Dothidella juniperi* (Desm.) v.Höhnel has few locules in small stromata, narrow asci and narrow fusoid ascospores. It is probably a species of *Mycosphaerella. Sphaerella fructinex* Kirschstein, according to description, differs from *D. acerva* in having separate ascocarps and narrow fusoid ascospores, and would be a species of *Mycosphaerella,* perhaps not differing from *Dothidella juniperi. Dothidea sphaeroidea* Cooke is the type species of *Coccodothis* Theissen & Sydow, a member of the Patellariaceae.

Rhizogene H. & P. Sydow, Ann. Mycol. 18: 181. 1920.

Ascocarps multiloculate, superficial from a subcuticular crustose hypostroma; hyphae penetrating leaf and branch tissue, forming yellowish spots on living leaves; ascocarps flattened, rounded or elongate, scattered or grouped, composed of vertically oriented rows of polygonal cells forming *textura angularis,* blackened toward the

surface, light brown internally; blunt tipped brown hyphae arising from the surface, especially from sides and lower surface; locules marginal, immersed, often visible as depressions in the stroma, usually horizontal; apical pore small. Asci oblong, bitunicate, sessile or the base foot-like, arising from a low basal cushion of hyaline cells. Ascospores overlapping biseriate in the ascus, hyaline, soon light dull brown, broadly elliptic or obovate; septum supramedian, usually slightly constricted; upper cell conic, the lower cell oblong or ovoid or nearly cylindric; wall smooth or finely roughened; contents homogeneous.

Conidial state unknown.

Parasitic on leaves and branches of woody dicotyledons, middle and western North America.

Although Müller and von Arx (1962) included *Rhizogene* in the Venturiaceae, the aspect of young and mature locules is dothideaceous and this genus seems better arranged among the Dothideaceae.

Type species: **R. impressa** (Ell. & Ev.) Barr.

Rhizogene impressa (Ell. & Ev.) Barr, comb. nov. Figures 141–144.

≡ *Karschia impressa* Ell. & Ev. Bull. Torrey Bot. Club 24: 470. 1897.
= *Lasiobotrys symphoricarpi* H. & P. Sydow, Ann. Mycol. 16: 244. 1918.
≡ *Rhizogene symphoricarpi* (H. & P. Sydow) H. & P. Sydow, Ann. Mycol. 18: 181. 1920.

Ascocarps 245–450 μ diam, 75–155 μ high; locules 70–100 μ high, 60–70 μ diam; wall thin, ca. 6.5 μ thick. Asci 35–55 × 8–11 μ. Ascospores 9–12 × 4.5–5.5 μ.

Parasitic, mostly hypophyllous on leaves, also on branches of *Symphoricarpos* spp., middle and western North America.

Material examined (pro parte):

Colorado: Pagosa, San Juan Mts., July 1897, *Bethel 356* (type of *Karschia impressa,* NY, BPI); San Juan Mts., July 1897, *Ell. & Ev. N.A.F. 3518* as *Lasiobotrys lonicerae* form *symphoricarpi* (isotype of *L. symphoricarpi*).

Several additional collections from Colorado, and others from Saskatchewan, Montana, Idaho, Wyoming, Utah, and California, have been examined. Many of these are immature and the locules are filled with hyaline cells or young asci. *Rhizogene impressa* is located in various herbaria under the unpublished names *Lasiobotrys lonicerae subcircinata* Ell. & Ev. ined., *L. subcircinata* Ell. & Ev. ined., *L. lonicerae* f. *symphoricarpi* Ell. & Ev. ined.

H. and P. Sydow based their original description of *Lasiobotrys symphoricarpi* on *Ell. & Ev. N.A.F. 3518.* The fungus in this exsiccatus is immature. Von Höhnel (1919) also examined immature specimens and noted that the hiatus between this taxon and *L. lonicerae* could be generic. The following year H. and P. Sydow erected *Rhizogene* for *L. symphoricarpi,* still based on immature specimens. Müller and von Arx (1962) were the first to provide details of asci and ascospores. The type material of *Karschia impressa* is on branches of *Symphoricarpos,* but differs in no other respect from the leaf-inhabiting form of the fungus.

Lasiobotrys Kunze, Mycol. Hefte 2: 88. 1823.

Sclerotial ectostromata grouped and forming small black areas on leaf spots or on thin branches, originating from a subcuticular, crustose hypostroma from which hyaline hyphae penetrate deep into host tissues; ectostroma rounded, flattened, black, composed of vertically oriented rows of cells forming *textura angularis,* blackened externally, hyaline to yellowish internally, the surface bearing down-hanging brown hyphae; ascocarps uniloculate, in hyphae at the lower sides of the ectostroma, globose, small; wall thin. Asci oblong or saccate, bitunicate, sessile, in a fascicle from the base of the locule. Ascospores overlapping biseriate in the ascus, greenish hyaline to light brown, elliptic to obovate; septum supramedian, usually slightly constricted; upper cell

conic, the lower cell elliptic or ovoid; wall smooth; contents homogeneous or minutely guttulate.

Parasitic on leaves and branches of woody dicotyledons, widespread.

Petrak (1927) and Müller and von Arx (1962) considered *Lasiobotrys* to be a member of the Venturiaceae. However, both the aspect of immature locules, and all that is known concerning stages of development (Arnaud 1925, Killian 1938) indicates that *Lasiobotrys* has a *Dothidea* type of development and must be placed in the Dothideaceae. Killian (1938) described and illustrated the development of ascocarps in a sequence: (1) formation of subcuticular hypostroma, (2) ectostroma produced by numerous divisions of the hypostromatic cells, (3) origin of free hyphae and ascocarps from division of certain epidermal cells on the lower sides of ectostroma, (4) ascocarps enlarged by cell divisions, resulting in differentiated wall and interior, (5) formation of ascogonial hyphae, followed by nuclear pairing, production of primitive croziers, and binucleate proasci within the young ascocarp.

Type species: *L. lonicerae* (Fr.) Kunze.

Lasiobotrys lonicerae (Fr.) Kunze, Mycol. Hefte 2: 88. 1823. Figures 145–147.

= *Lasiobotrys affinis* Harkn. Bull. Calif. Acad. Sci. 1: 42. 1884.

Müller and von Arx (1962) provided detailed synonymy of *L. lonicerae.* A number of morphological forms have been described. Until additional evidence is available, only one variable species is recognized in the genus.

Leaf spots 3–10 mm diam, yellowish or grayish, slightly hypertrophied and raised, often with reddish margin; sclerotial ectostromata 135–350 μ diam, 125–200 μ high; ascocarps (30–)52–120 μ diam. Asci 30–63.5(–70) × 11.5–15 μ. Ascospores 10–17 × 4.5–6.5(–8) μ.

Parasitic, mostly epiphyllous on leaves and on thin branches of *Lonicera* spp., Europe, North Africa, Asia, western North America.

Material examined:

British Columbia: Owl Creek, 25 June 1951, *Hansbrough* (BPI, NY). Idaho: *Henderson 4353* (BPI); Spirit Lake, 4 Sept 1920, *Rhoads* (BPI); Potlatch, 15 Sept 1920, *Stillinger* (BPI); Musselshell Ranger Station, 15 July 1924 (BPI); *Weir 20084* (BPI). Washington: *Suksdorf's Flora of Washington 269* (NY); *Ell. & Ev. N.A.F. 3107, Fungi Columbiani 510.* Wyoming: *Nelson, Flora of Wyoming 4112* (BPI). Oregon: Jefferson, 3 Apr 1934, 3 July 1934, *Bailey* (BPI, NY); Lake Mt. trail, Oregon caves, 12 Aug 1929, *Darker* (DAOM); Crater Nat. Park, 6 Aug 1930, *Goodding* (NY); Talent, 20 June 1915, *Posey* (NY); Woldport, Aug 1934, *Zeller* (NY). California: Hayward Canyon, 25 Nov 1922, *Bain* and *Fields* (BPI); *Baker, Plants of the Pacific Coast 1820, 2695* (NY); Los Gatos Canyon, Santa Clara Co., 29 Dec 1923, *Bonar* (MICH); *Beattie 5925* (BPI); Bear Gulch Road, 3 Dec 1893, *Dudley* (BPI); *Harkness 2539* (type of *L. affinis,* CAS), Tamalpais, June 1883, *Harkness* (NY); *Parks, Calif. Fungi 273* (BPI, MICH, NY); near Granville Lake, 19 Apr 1903, *Thompson* (BPI); *Tracy 6874, 15115* (BPI, MICH).

In the type specimen of *Lasiobotrys affinis* Harkness, a number of the sclerotial ectostromata contain a cavity into which conidiophores protrude. The latter are short and simple or elongate and bear short side branches. Microconidia are abstricted from tips of branches or from apices of conidiophores, are hyaline at first, becoming light brown, 2.5–3.5 × 1.5–2 μ, elliptic, one-celled.

Bonar (1928) described a conidial fungus which developed from single ascospores on agar medium. A scanty brown to black aerial mycelium was produced in culture, forming conidiophores as erect dark hyphae. Conidia arose singly at the apex and were pushed aside by elongation of the conidiophore, from the new apex producing another conidium. Conidia were globose or elliptic, one-celled and subhyaline at first, becoming transversely and vertically septate, brownish black with wall tubercular-roughened, at maturity reaching a size of 25 × 12–15 μ. The fungus would seem to be related to *Cladosporium.*

Von Höhnel (1919a) distinguished four species of *Lasiobotrys* on the basis of four

different supposed conidial states which belonged to the genera *Colletotrichella* and *Kabatia.* Müller (1953a, 1957, 1959b) proved by cultural studies that these conidial states were part of the life cycle of three species of *Guignardia* (i.e. *Discosphaerina*), and that they had no connection with *Lasiobotrys.*

Herpotrichiellaceae Munk, Dansk Bot. Arkiv 15(2): 131. 1953; 17(1): 438. 1957.

Ascocarps uniloculate, globose, conic, or depressed, superficial or immersed erumpent; wall thin, of few layers of somewhat compressed dull gray brown or olivaceous cells; surface often roughened by short blackish brown setae or protruding cells; apical pore small, stuffed with small pallid or brownish cells at first. Asci oblong or saccate, arising in a fascicle from the base of the locule, aparaphysate, bitunicate, octo- or polysporous. Ascospores crowded or overlapping biseriate in the ascus, hyaline becoming dull olivaceous, grayish brown or dark dull brown, oblong, elliptic, fusoid, or elongate, straight to curved, one- to several-septate, frequently with a vertical septum in one or more cells; cells containing several minute guttules or one large globule; smooth, without gelatinous coating.

Conidial state unknown.

Saprobic, often hypersaprobic on old fungi, or on decayed wood or herbaceous stalks and leaves.

Munk (1953) erected this family to accommodate *Herpotrichiella, Capronia,* and *Berlesiella* and his new genera *Didymotrichiella* and *Dictyotrichiella.* He stressed as characteristic the minute size and often hypersaprobic nature of the ascocarps, as well as the dull grayish or olivaceous brown colors of the wall and of the ascospores. Müller and von Arx (1962) included *Herpotrichiella* in the Pleosporaceae and did not recognize the Herpotrichiellaceae as a separate family. They expressed doubts as to the validity of genera based solely on ascospore septation, because of variability within species, and combined *Didymotrichiella* with *Herpotrichiella.* Earlier (in Bigelow & Barr 1963), I agreed with Müller and von Arx and relegated species of *Herpotrichiella* to the Pleosporaceae. Now I must reverse my stand and uphold the family Herpotrichiellaceae for those taxa which appear to have a *Dothidea* type of development according to structure of the mature locule.

However, not all of the taxa included in the Herpotrichiellaceae by Munk are of this type. As Shoemaker (pers. comm.) suggested, the species of *Dictyotrichiella* have short apical pseudoparaphyses, and must be considered to exhibit a variation of the *Pleospora* developmental type. The appearance of the locule apex in these species is much like that in species which have been classified in the Capnodiaceae (Corlett 1970). Re-examination of the specimens which were listed under *Berlesiella nigerrima* (Barr in Bigelow & Barr, 1969) revealed that short apical pseudoparaphyses were present in all of the collections cited. Thus, *Berlesiella* and its type species must be transferred to the Pleosporales. *Herpotrichiella setosa* Barr (1959) has apical pseudoparaphyses also and must be removed from this genus. According to Petrak's original description (1914), and by analogy with species that appear to be closely related, *Herpotrichiella* lacks apical pseudoparaphyses and has a locule of the Dothidea type. Perhaps the taxa removed from the Herpotrichiellaceae could be accommodated in the Dimeriaceae; further studies of the complex situation in the Pleosporales are needed before their disposition can be ascertained.

The small number of species recognized here as dothideaceous and grouped in the Herpotrichiellaceae are distinguished generically on the bases of ascospore shape and the possession of octo- or polysporous asci. *Herpotrichiella* has octosporous asci and the fusoid elliptic ascospores are usually several-septate and may have a vertical septum in one or more cells. *Capronia* has polysporous asci and the fusoid elliptic ascospores are several-septate with a vertical septum in several cells. The new genus *Polytrichiella* is described for those species which have polysporous asci whose ascospores are narrowly fusoid or elongate, one- to several-septate, and lack a vertical septum.

Key to Genera

1. Asci octosporous; ascospores elliptic fusoid, (one–)several-septate, often with vertical septum. *Herpotrichiella*
1. Asci polysporous.
   2. Ascospores elliptic fusoid, several-septate, usually with vertical septum. *Capronia.*
   2. Ascospores narrowly fusoid or elongate, one- or several-septate, without vertical septum. *Polytrichiella.*

Herpotrichiella Petrak, Ann. Mycol. 12: 472. 1914.

Ascocarps globose or conic, rarely depressed, superficial, scattered; surface setose or roughened by protruding cells; wall thin, dull brownish or grayish. Asci oblong or saccate, octosporous, bitunicate. Ascospores hyaline, soon light olivaceous brown or grayish brown, fusoid or elliptic; one- to several-septate, often with vertical septum in one or more cells.

Saprobic or hypersaprobic, on old wood, other fungi, or leaves and branches of woody plants.

Müller and von Arx (1962) included *Didymotrichiella* Munk as a synonym of *Herpotrichiella.* However, their description of *H. inconspicua* (Munk) Müller and von Arx, the type species of *Didymotrichiella,* included pseudoparaphyses. Since I have not seen this species, I cannot synonymize *Didymotrichiella* with *Herpotrichiella.*

Type species: *H. moravica* Petrak, Ann. Mycol. 12: 472. 1914.

On rotting *Fagus* wood, Europe. For description see Petrak (1914) and Munk (1957).

Additional species:

Herpotrichiella parasitica (Ell. & Ev.) Barr, comb. nov. Figures 148–150.

≡ *Melanomma parasitica* Ell. & Ev. Proc. Acad. Nat. Sci. Philadelphia 42: 240. 1891 ["1890"].

Ascocarps 120–150 μ diam, globose or conic; wall thin, ca. 10 μ thick, dull brownish, covered with short setae or protruding cells 10–22 μ long. Asci 35–40 × 7.5–10 μ, oblong. Ascospores 9–11 × 3.5–4 μ, dull grayish brown, elliptic fusoid, tapered to slightly pointed ends, straight to inequilateral, 3-septate, not or slightly constricted at the septa; contents guttulate.

On old stromata of *Diatrype* sp., eastern North America.

Material examined:

New Hampshire: *Barr 3876, 3877* (MASS). New Jersey: *Ell. & Ev. N.A.F. 2367.*

This species appears to be closely related to the type species. *H. moravica* has somewhat more elongate setae and slightly longer ascospores (10–14 × 3–4 μ), than does *H. parasitica.* The latter has a plushy aspect under the dissecting microscope, due to the very short setae.

Herpotrichiella spinifera (Ell. & Ev.) Barr in Bigelow & Barr, Rhodora 65: 300. 1963.

On and partially immersed in hymenia of old Basidiomycetes, North America. For description and synonymy see Bigelow & Barr (1963).

Herpotrichiella pilosella (Karst.) Munk, Dansk Bot. Arkiv 17(1): 438. 1957.

≡ *Sphaeria pilosella* Karst. Mycol. Fenn. 2: 96. 1873.
≡ *Melanomma pilosella* Karst. in Sacc. Syll. Fungorum 2: 114. 1883.

Ascocarps 90–200 μ diam, globose depressed, scattered or grouped on a thin weft of hyphae; wall 7.5–10 μ thick, of 2–3 layers of slightly compressed cells, bearing blackish brown setae over the upper half; setae (10–)20–55(–65) μ long, 3–5 μ wide near base, tapering to blunt points, straight or sinuous, one-celled or septate. Asci

44–45 × 10–15.5 μ, oblong or saccate. Ascospores 11–15.5 × 3.5–5(–6) μ, elliptic obovate, straight or inequilateral with rounded ends, (1–2–)3-septate, not constricted at septa; vertical septum present in mid cells at times, contents minutely guttulate.

On old wood of *Betula, Salix,* Europe, North America.

Material examined:

Quebec: *Barr 2920* (MASS). New Hampshire: *Barr 4063B* (MASS). Idaho: *Slipp 681* (MASS).

Herpotrichiella fusispora Barr, Contr. Inst. Bot. Univ. Montréal 73: 28. 1959.

On dead leaves and branches of *Cassiope* and *Phyllodoce* spp., North America.

For description see Barr (1959). Two collections on *Cassiope* from British Columbia (*Barr 647, 683,* MASS) are referable to this species. The ascocarps are usually setose, but occasionally the wall is only roughened by protruding cells. Ascospores which in the type material are 13.5–20(–27) × 3–5 μ and 1- to 5-septate, measure 22–33 × 4.5–5.5 μ in the western collections, and are 5- to 7-septate. In all collections the ascospores are fusoid and may be straight or curved.

Capronia Sacc. Syll. Fungorum 2: 288. 1883.

Ascocarps superficial on a thin weft of hyphae, globose or conic; surface roughened by short setae or protruding cells; wall thin. Asci usually saccate, polysporous. Ascospores hyaline to dull brown, elliptic or fusoid, often inequilateral, usually with vertical septum in one or more cells, minutely guttulate.

On woody stalks or branches, Europe, North America.

Type species: *C. sexdecemspora* (Cooke) Sacc.

For description see Saccardo (1883).

Additional species:

Capronia irregularis Barr, sp. nov. Figures 151–152.

Ascocarpia 82–130 μ diametro, globosa, peridio 10 μ crasso, superficie papilloso. Asci 39–67 × 21–39 μ, saccati vel ovati, bitunicati, 32-spori. Ascosporae 15–22.5 × (5–)6–9 μ, hyalinae vel obscurae olivaceo-brunneae, elliptico-fusoideae, (3–)5 (7–)-septate et septo verticali instructae.

Specimen typicum in ramulis emortuis *Empetri nigri,* prope "top of Mont Albert, Gaspé Provincial Park, Quebec, 8 July 1957," a *M. E. Barr* lectum, n. *1970*; in Herb. Univ. Mass. depositum.

Ascocarps 82–130 μ diam, globose; surface roughened by projecting thick walled cells; wall dull grayish brown, darker in upper portion, ca. 10 μ thick. Asci 39–67 × 21–39 μ, saccate or ovate, 32-spored. Ascospores 15–22.5 × (5–)6–9 μ, hyaline, soon dull grayish or olivaceous brown, elliptic fusoid, tapered to blunt or pointed ends, straight or inequilateral, (3–)5 (–7)-septate, not constricted at septa; vertical septum one in each cell, usually oblique in the end cells; secondary transverse septa often irregularly inserted.

On dead branches of *Empetrum nigrum* L., *Rhododendron lapponicum* (L.) Wahlenb., eastern North America.

Material examined:

Quebec: *Barr 1970* (type), *2275* (MASS).

Rather than by setae protruding from the wall of the ascocarp, the surface is irregularly roughened by protruding cells.

Polytrichiella Barr, gen. nov.

Ascocarpia globosa, conica, vel depressa, erumpentia vel superficialia, peridio tenui, superficie setoso. Asci oblongi, ovati vel saccati, bitunicati, polyspori. Ascosporae hyalinae vel dilute olivaceae vel fumosae, fusoideae vel elongatae, uni- vel pluri-septatae.

Species typicum: *P. polyspora* (Barr) Barr.

Ascocarps globose, conic or depressed, erumpent to superficial, seated on a thin weft of brown hyphae; wall thin, dull grayish brown, with short to elongate setae over the upper half; setae blackish brown, pointed, straight or curved, one-celled or occasionally septate; apical pore small. Asci oblong, ovate, or saccate, bitunicate, polysporous. Ascospores crowded or in a fascicle in the ascus, hyaline to light olivaceous or grayish brown, fusoid or elongate, 1- to several-septate, not constricted at septa; contents minutely guttulate.

Saprobic on woody or herbaceous plants, North America.

The taxa described in this genus all have polysporous asci as in *Capronia,* and narrow fusoid or elongate ascospores. The ascospores of the type species are broad and at times resemble those of species of *Herpotrichiella.* However, the species form a sequence in which ascospore shape varies from elliptic fusoid to elongate fusoid, nearly cylindric.

Polytrichiella polyspora (Barr) Barr, comb. nov.

≡ *Herpotrichiella polyspora* Barr, Contr. Inst. Bot. Univ. Montréal 73: 29. 1959.

On *Cassiope tetragona* (L.) D. Don, *Empetrum nigrum* L., North America.

For description see Barr (1959). This species with approximately 32 ascospores in an ascus exhibits variability in ascospore size and septation, even in a single collection. The range of ascospore sizes is (6–)9–18 × (2–)3–4.5(–7) μ, and the elliptic fusoid ascospores may be 1-, 2-, or 3-septate.

Additional species:

Polytrichiella albimontana Barr sp. nov. Figures 153–155.

Ascocarpia 70–90 μ diametro, 60–80 μ alta, globoso-depressa, peridio 5.5–7.5 μ crasso; setae numerosae, 16–44 μ longae, recurvatae. Asci 33–46 × 11–16.5 μ, oblongi, bitunicati, sexdecemspori. Ascosporae 17.5–27.5 × 1–2(–2.5) μ, hyalinae, fusoideae, curvatae, uniseptatae.

Specimen typicum in floribus emortuis *Gei peckii,* prope "Lake of the Clouds, Mt. Washington, New Hampshire, 23 July 1963," a *M. E. Barr* n. *3965* lectum; in Herb. Univ. Mass. depositum.

Ascocarps 70–90 μ diam, 60–80 μ high, globose or depressed, erumpent superficial; wall 5.5–7.5 μ thick; setae numerous over upper portion of wall, 16–44 μ long, 2.5–4 μ thick near base, blackish brown, curved, pointed. Asci 33–46 × 11–16.5 μ, 16-spored. Ascospores in a fascicle in the ascus, 17.5–27.5 × 1–2(–2.5) μ, hyaline, fusoid, usually curved, 1-septate in the middle, not constricted, the upper cell broader than the lower.

On overwintered flower heads of *Geum peckii* Pursh, eastern North America.

Material examined:

New Hampshire: *Barr 3965* (type, MASS).

Recurved setae and shape of the ascospores distinguish this species from others of the genus.

Polytrichiella longispora Barr sp. nov. Figure 156.

Ascocarpia 60–120 μ diametro, globosa, peridio 5.5–9 μ crasso; setae apicales, usque ad 40 μ longae. Asci (33-)55–62 × (7.5–)10–13.5 μ, oblongi, bitunicati, sexdecemspori. Ascosporae 46–60 × 1.5–2(–2.5) μ, hyalinae, elongato-fusoideae, curvatae, (3–)5–7-septatae.

Specimen typicum in pedunculis emortuis *Leptarrhenae pyrolifoliae,* prope "Garibaldi Provincial Park, British Columbia, 8 Aug 1952," a *M. E. Barr* n. *687A* lectum; in Herb. Univ. Mass. depositum.

Ascocarps 60–120 μ diam, globose, erumpent superficial; wall 5.5–9 μ thick; setae few to numerous around apex, short or up to 40 μ long, blackish brown, pointed. Asci (33–)55–62 × (7.5–)10–13.5 μ, oblong, 16-spored. Ascospores in a fascicle or coiled in the ascus, 46–60 × 1.5–2(–2.5) μ, hyaline, elongate fusoid (the upper portion somewhat broader than the lower, slightly curved), tapered to pointed ends, (3–)5–7-septate, not constricted; contents minutely guttulate.

On overwintered peduncles of *Leptarrhena pyrolifolia* (D.Don) R.Br., western North America.

Material examined:

British Columbia: *Barr 687A* (type, MASS).

The elongate ascospores in *P. longispora* are long fusoid rather than filiform and are pointed at both ends.

Capnodiaceae (Sacc.) v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. 1, 119: 625. 1910.

= *Perisporiaceae* subfam. *Capnodiaceae* Sacc. Syll. Fungorum 1: 73. 1882.
= *Capnodiales* Woronichin, Ann. Mycol. 23: 177. 1925.

Ascocarps uniloculate, superficial on a thin or well developed massive subiculum of hyphae; hyphae interwoven and anastomosed, dark brown, thick walled, cylindric, the walls smooth or roughened; ascocarps globose, conic, or elongate and sterile at base; wall thin, dark brown, rarely light or bright colored, composed of few layers of polygonal cells, glabrous or bearing cylindric, septate hyphal appendages; apical pore small. Asci saccate, oblong, elliptic or clavate, bitunicate, in a fascicle from the base of the locule, usually octosporous, aparaphysate. Ascospores crowded in the ascus, hyaline or brown, variable in shape and septation; contents with one or more globules; wall smooth or roughened, rarely surrounded by a gelatinous coating.

Conidial states variable: Pycnidial state: pycnidia closely associated with and similar in aspect to ascocarps; conidia hyaline or brownish, one-celled, small. Hyphomycetous states: *Hormisciella* phragmoconidia arising from hyphal cells as blown-out portions of the lateral wall, brown, elongate, elliptic or fusoid to nearly cylindric, straight or curved, several-septate, the wall thick and dark except at apex and basal scar; *Capnophialophora* or *Hormisciomyces* phialides produced on hyphae, germinating ascospores and/or phragmoconidia, sessile or on 1–2-celled stalks, light brown, ovoid or subglobose, with funnel-shaped collarette; phialides proliferating laterally to form sympodial chains; phialospores rarely seen, minute, hyaline.

Usually superficial on resinous or insect exudates on living leaves or branches of gymnosperms and woody angiosperms.

Numerous genera have been assigned to the Capnodiaceae. The common characters of these genera are the superficial ascocarps developed on or in a thin or well developed hyphal subiculum. Fraser (1935) reported a *Dothidea* type of development for species of *Capnodium.* Martin (1961) and Luttrell (1951b, 1955) considered the family to belong in the Dothideales. Later Luttrell (1965) utilized the ordinal name Capnodiales for members of this family and suggested that other genera with superficial ascocarps also belonged in the order.

Hughes' recent studies (1966, 1967, 1968, pers. comm.) on conidial states of capnodiaceous fungi led to the realization that two series of genera are involved. Not only do conidial states differ, but the hyphae of subiculum and appendages are either cylindric or definitely tapered. These hyphal types are correlated with specific conidial types. Corlett (1970) made a comparative developmental study of two species of capnodiaceous fungi which superficially appeared to be closely related. He described the *Dothidea* type of development for an unidentified species of *Aithalomyces* which had cylindric hyphae. *Metacapnodium juniperi* (Phil. & Plowr.) Speg., with tapered

hyphae, exhibited a *Pleospora* type of development which included the formation of short apical pseudoparaphyses.

The genera and species assigned to the Capnodiaceae must be thoroughly investigated so that the limits of the family may be drawn. At this time, I can put forth only a tentative outline of those genera from temperate North America which do appear to have a *Dothidea* type of development and are grouped in the family Capnodiaceae sens. str. The other series of genera must be transferred to the Pleosporales, as a family related to the Chaetothyriaceae and Dimeriaceae. Temperate North American representatives of *Limacinia* sens. str. and *Ophiocapnocoma* have tapering hyphae and appendages, *Capnocybe* or *Hormiokrypsis* conidia, and exhibit a *Pleospora* type of development. These genera are excluded from my concept of Capnodiaceae.

Key to Genera

1. Ascocarps depressed globose, yellowish or orange, not appendaged, on a thin subiculum; ascospores one-septate. *Rhytidenglerula.*
1. Ascocarps globose depressed or vertically elongated, dark brown to black, appendaged or not; ascospores several-septate.
   2. Ascocarps vertically elongated, the base sterile, not appendaged; conidia borne in flask-shaped pycnidia accompanying ascocarps. *Scorias.*
   2. Ascocarps globose or depressed, appendaged; conidia arising from hyphae and/or phialides.
      3. Ascospores transversely septate; phialidic conidial state *Hormisciomyces.* *Aithalomyces.*
      3. Ascospores both transversely and vertically septate; phialidic conidial state *Capnophialophora.* *Strigopodia.*

Phaeocapnias Cif. & Bat., which according to Hughes (1968) has cylindric hyphae and produces *Hormisciella* conidia and *Hormisciomyces* phialides, probably belongs in this family. The ascospores are transversely septate and mucronate at the ends.

Rhytidenglerula v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss Kl. Abt. 1, 127: 386. 1918.

Subiculum thin, brown, of septate, cylindric, hyphopodiate hyphae; ascocarps seated on the subiculum, bright yellowish orange, depressed globose with plane apex; wall thin, of one layer of cells, gelatinizing above, the basal wall brown. Asci subglobose. Ascospores hyaline becoming brown (the pigment mostly encrusted on the wall), elliptic to obovate, 1-septate, constricted at the septum; wall roughened.

Conidial state: *Capnodiastrum* Speg.: Pycnidia similar to ascocarps; conidia brown, one-celled.

Type species: *R. carnea* (Ell. & Mart.) v.Höhnel.

Rhytidenglerula carnea (Ell. & Mart.) v.Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. 1, 127: 386. 1918. Figures 157–158.

For synonymy see Müller and von Arx (1962).

Ascocarps 70–80 μ diam, about 50 μ high. Asci 30–34 × 22–26 μ. Ascospores 16–21 × 8–10 μ, obovate; upper cell broader than lower.

On living leaves of *Persea borbonia* (L.) Spreng., southeastern North America.

Material examined:

Florida: *Ellis N.A.F. 1290.*

This genus has been placed in the family Englerulaceae, which is characterized by thin walled, gelatinizing ascocarps. Although *Rhytidenglerula* differs from the other genera of the Capnodiaceae in its brightly colored ascocarps and sparse subiculum, the structure of the locule appears to be dothideaceous, and the genus is tentatively transferred to the Capnodiaceae.

Scorias Fr. Syst. Orb. Veget. 1: 171. 1825; Syst. Mycol. 3: 291. 1832.

Subiculum massive, black, forming irregular points, composed of interwoven cylindric brown hyphae adhering together in gelatinous matrix; ascocarps vertically elongated (the base sterile), grouped and arising from the subiculum; wall glabrous, thin; apex rounded. Asci oblong to saccate. Ascospores hyaline, olivaceous brown at maturity, clavate, several-septate; wall smooth or roughened.

Conidial state: Pycnidia flask-shaped, intermixed with ascocarps; conidia minute, brown, one-celled.

Type species: *S. spongiosa* Schw. ex Fr.

Scorias spongiosa Schw. ex Fr. Syst. Mycol. 3: 291. 1832. Figures 159–161.

Ascocarps 50–84 μ diam, 60–140 μ high, the sterile base 60–200 μ long; wall ca. 12 μ thick, pallid at apex. Asci 38.5–50 × 10–13 μ. Ascospores 13–15 × 3.5–4.5 μ, hyaline, soon olivaceous brown, clavate, 3-septate, not constricted at the septa or slightly constricted at the primary septum; wall finely roughened at maturity.

Pycnidia 30–50 μ diam, 100–150 μ high, tapering to an elongate apex 12–18 μ diam, up to 200 μ long; conidia minute.

On leaves and branches of *Fagus* spp., Europe, North America.

Material examined:

New York: New York, Feb 1917, *Codding* (MASS); Ohio: *Cooke 37593, 38203* (MASS); Pennsylvania: *Ellis N.A.F. 1363, 1363b;* North Carolina: Greensborough, 1957, *Schuster* (MASS).

In *Scorias spongiosa* the massive subiculum may reach several cm in diameter and is composed of cylindric brown hyphae, each surrounded by a gelatinous coating. Over the surface of the sterile mycelium ascocarps and pycnidia are produced. Both are glabrous and have a short to elongate sterile base. Ascocarps are globose ovate whereas pycnidia are narrowly ovate or flask shaped. The hyphal structure, especially the gelatinous coating over hyphae and fruiting structures, is somewhat reminiscent of that in *Atichia* in the Myriangiales.

Aithalomyces Woronichin, Ann. Mycol. 24: 148. 1926.

Subiculum blackish brown, composed of cylindric, dark brown, branched and anastomosed hyphae; cells short, somewhat constricted at septa, thick walled, often roughened with encrusted brown pigment; ascocarps globose or depressed, seated in the subiculum; wall thin, clothed with septate, cylindric, hyphal appendages which are usually lax and trailing. Asci saccate oblong, aparaphysate. Ascospores brown, obovate or elliptic, several-septate, often constricted at the septa, crowded in the ascus.

Conidial states: *Hormisciella* phragmoconidia, *Hormisciomyces* phialides.

Woronichin (1926) described *Aithalomyces* with two species, *A. arctica* and *A. rhododendri.* Although he did not specifically designate either as type species of the genus, his emphasis in the article was on *A. arctica.* He discussed this species in some detail and compared it with *Limacinia* (?) *alaskensis* Sacc. & Scalia which he concluded was probably also a species of *Aithalomyces.* A translation of a pertinent paragraph reads:

> All these considerations cause me to separate the described fungus (i.e. *A. arctica*) as representative of a separate genus (*Aithalomyces*) to which probably *Limacinia* (?) *alaskensis* Sacc. & Scal. must be transferred.

Woronichin went on to discuss a second species which he described as *A. rhododendri.* Thus Woronichin effectively designated *Aithalomyces arctica* Wor. as type of the generic name. Batista and Ciferri (1963) were incorrect in designating *A. rhododendri* Wor. as the generic type.

Lectotype: *A. arctica* Wor.

Aithalomyces arctica Wor. Ann. Mycol. 24: 149. 1926.

≡ *Limacinia arctica* (Wor.) Barr, Canad. J. Bot. 39:310. 1961.

For description and illustration of ascospores see Barr (1961).

Woronichin (1926) described *Clasterosporium*-like conidia which were associated with the hyphae of *A. arctica.* These were elongate elliptic, curved at the ends, 53–63 × 10 μ, 7- to 9-septate, brown, with a circular basal scar. He suggested that they developed directly from the hyphae as do the *Clasterosporium* conidia of *Hormiscium pinophilum* (Nees ex Pers.) Lindau. From his description, the conidia would seem to be referable to *Hormisciella.*

Additional species:

Aithalomyces alaskensis (Sacc. & Scalia) Barr, comb. nov. Figures 165–167.

≡ *Limacinia* (?) *alaskensis* Sacc. & Scalia, Harriman Alaska Expedition 5: 34. 1904.
≡ *Morfea alaskensis* (Sacc. & Scalia) Bat. & Cif. Saccardoa 2: 142. 1963.

For description and illustrations see Barr (1955).

Phragmoconidia and phialides were described for this species (Barr 1955). *Morphea* Roze (as '*Morfea* Roz' in Batista and Ciferri 1963) was apparently based on conidial structures, and neither asci nor ascospores were described. Saccardo, in Sylloge Fungorum 22: 63, considered the species of *Morphea* as potential conidial states of *Limacinia* or of *Capnodium.* No evidence has been presented that *Morphea* is an ascomycete.

Following the suggestions of Woronichin (1926), Corlett (1970), and Hughes (pers. comm.), I am transferring *Limacinia* (?) *alaskensis* to *Aithalomyces.* Other species of *Limacinia,* e.g. *L. moniliformia* (Fraser) Barr, *L. quinquesepta* (Barr) Hughes, and *L. multiseptata* Barr [= *Ophiocapnocoma phloiophilia* (Fisher) Hughes], all possess tapered hyphae and ascocarp appendages as well as different conidial states. My re-examination of slides of these three species showed that short apical pseudoparaphyses were present, and a *Pleospora* type of development is inferred.

Strigopodia Batista in Bat., Maia & Vital, Anales Soc. Biol. Pernambuco 15: 440. 1957.

Subiculum massive, on resinous exudate on conifer bark; hyphae brown, cylindric; ascocarps seated in the subiculum, globose; hyphal appendages cylindric, occasionally sparse or lacking; wall of polygonal brown cells, thin. Asci oblong or saccate. Ascospores hyaline at first, soon yellow brown or dark brown, elliptic, several-septate; vertical septum present in one or several of mid cells; wall lighter brown toward both ends, smooth.

Conidial states: *Hormisciella* phragmospores, *Capnophialophora* phialides.

On resinous exudates on branches of gymnosperms, North America, Europe.

Type species: *S. resinae* (Sacc. & Bres.) Hughes.

Strigopodia resinae (Sacc. & Bres.) Hughes, Canad. J. Bot. 46: 1100. 1968. Figures 162–164.

Hughes (1968) described, discussed and illustrated details of this species and of *S. batistae. S. resinae* is known from Europe and eastern North America. An additional collection which is referable to this species is that designated as *Chaetosphaeria resinicola* n.sp. *Peck,* ined., Jayville, New York, June (NYS). The specimen agrees with Hughes' description except for the somewhat smaller sizes of its asci and ascospores.

Additional species:

Strigopodia batistae Hughes, Canad. J. Bot. 46: 1104. 1968.

On *Larix* and *Pseudotsuga,* western North America.

For description and illustrations see Hughes (1968).

Strigopodia spongiosa (Barr) Barr, comb. nov.

≡ *Capnodium spongiosum* Barr, Canad. J. Bot. 33: 511. 1955.
≡ *Capnophaeum spongiosum* (Barr) Bat. & Cif. Saccardoa 2: 108. 1963.

For description and illustrations (excluding figures 35 and 39) see Barr (1955). The specimens cited should be revised to exclude the collection from Washington (*W. B. Cooke 19660*) which is *S. batistae* Hughes. Also, it is obvious that at least two different fungi are associated in the massive subicula of the California collections. *Capnocybe spongiosa* (Hoerl) Hughes with tapered hyphae and sympodioconidia (cf. Hughes, 1966 and Barr, 1955, figs. 35, 39) forms a large portion of the subicula in the California material. Slides made during my earlier study of these collections bear both tapered and cylindric hyphal components. The ascocarps of *Strigopodia spongiosa* are borne on cylindric hyphae and their appendages are cylindric also.

There does not appear to be any difficulty in transferring the present species to *Strigopodia.* Phragmoconidia referable to *Hormisciella* and *Capnophialophora* phialides are both formed on cylindric hyphae (my 1955 "subiculoid hyphae of the second type"); ascocarps, asci, and ascospores are all typical of *Strigopodia.* The ascospores are septate in the same manner as those of *S. resinae,* with median primary septum, whereas those of *S. batistae* have submedian primary septum. Ascospores of *S. spongiosa* are narrower than those of the other two species.

I cannot accept Batista and Ciferri's transfer of this species to *Capnophaeum.* The type species of the latter genus, *C. indicum* (Bern.) Speg., was described as having closely associated elongate pycnidia containing small hyaline conidia. *Capnophaeum* should be restricted to species with similar pycnidial association. The genus would appear to be more closely related to *Scorias* than to *Strigopodia.*

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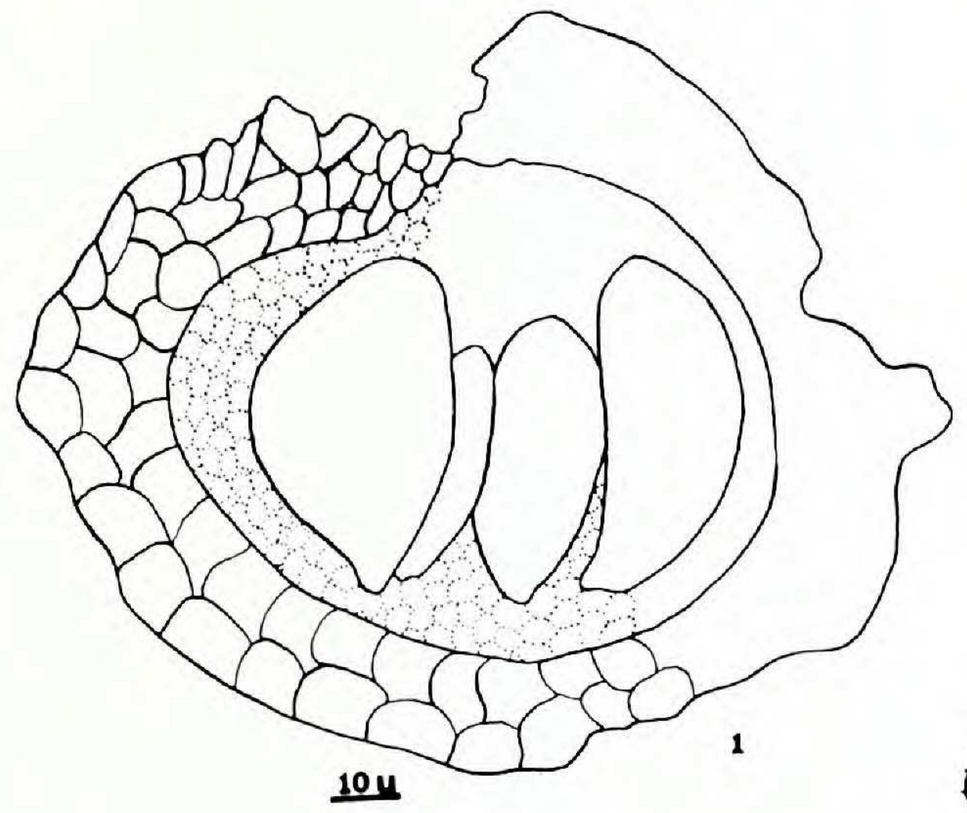
Addendum

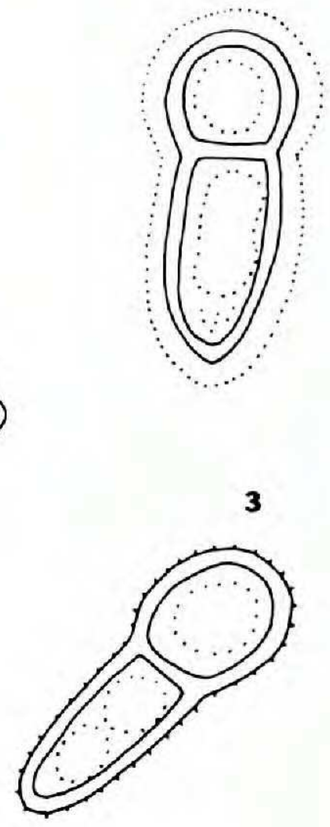
Melanodothis R. H. Arnold, Canad. J. Bot. 49: 2188. 1972 ["1971"].

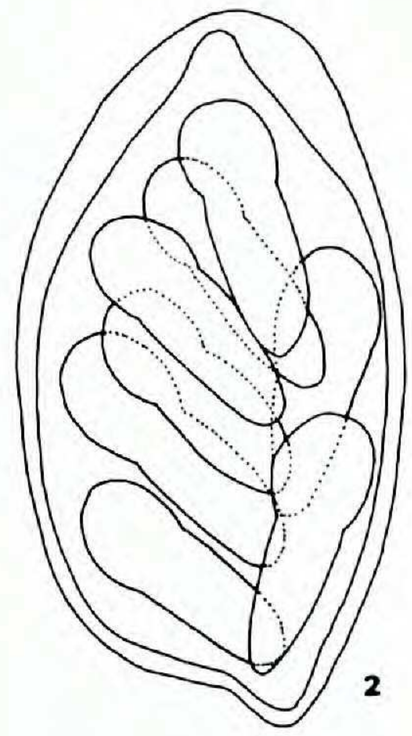
Type species: *Melanodothis caricis* R. H. Arnold.

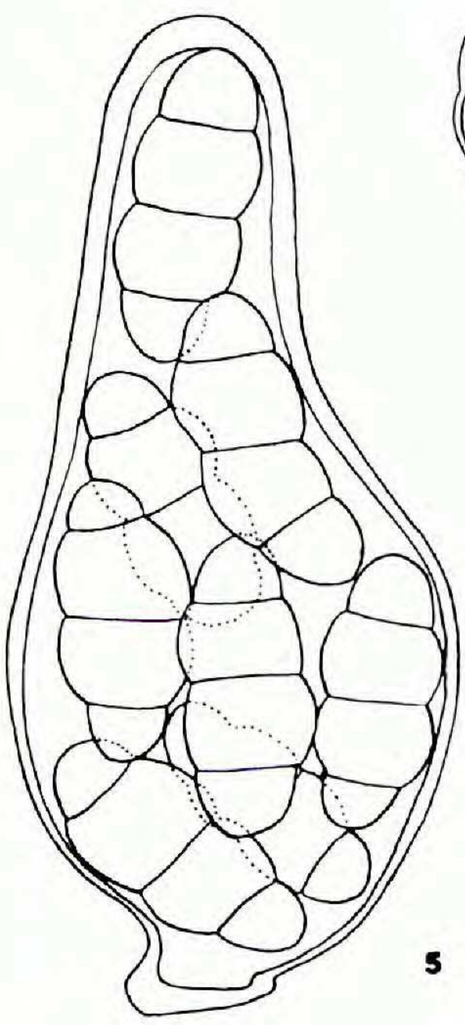
The genus belongs in the Dothideaceae, as established by Arnold (*Melanodothis caricis,* n. gen., n. sp. and *'Hyalodothis ? caricis.'* Canad. J. Bot. 49: 2187–2196.) with her account of structure and development, and the excellent illustrations. *Ramularia*-like conidia were formed in culture, as in some species of *Mycosphaerella.* The aspect of stromata is quite like that of *Rhizogene,* but shape, septation, and pigmentation of the ascospores differ between the two genera. This genus could be keyed out in the Dothideaceae next to *Discosphaerina,* which also has one-celled hyaline ascospores, and the two separated as follows:

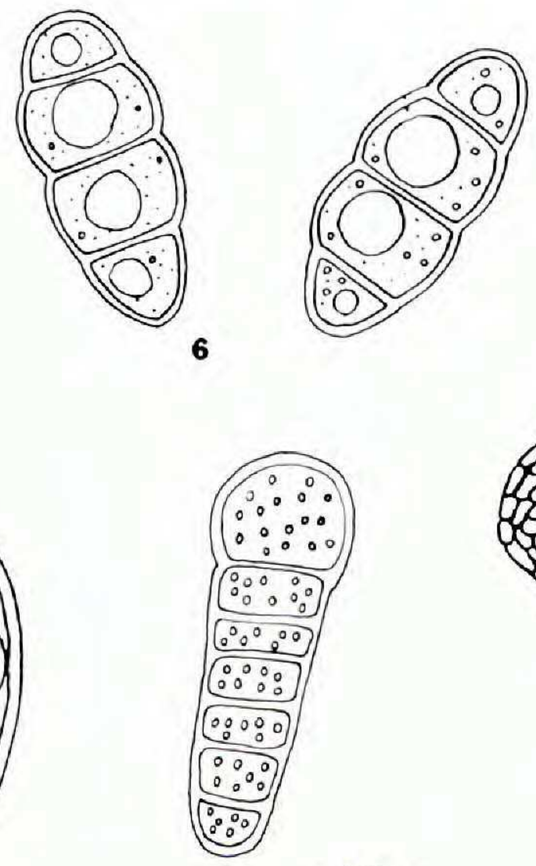
1. Ascocarps uniloculate or few together. *Discosphaerina.*
1. Ascocarps multiloculate, produced from and over hypostromatic tissues. *Melanodothis.*

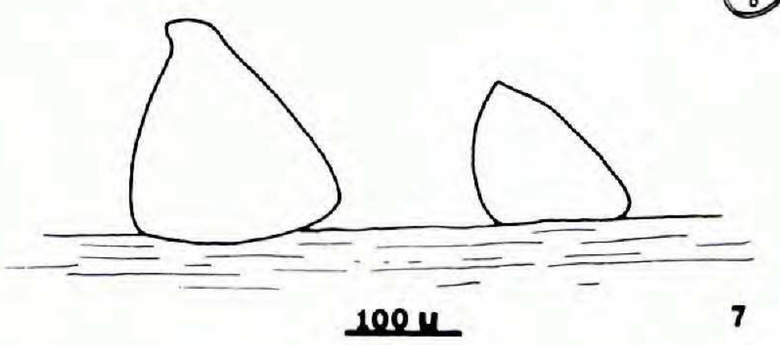


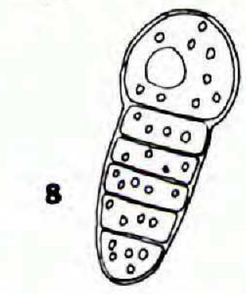


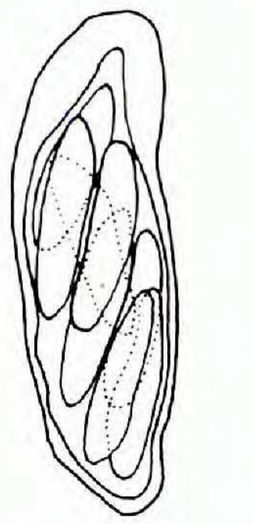


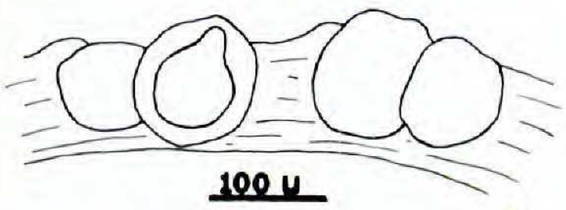


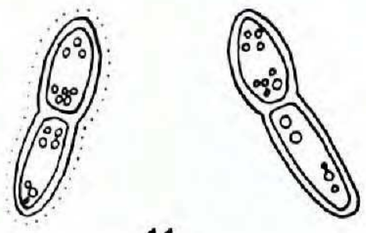




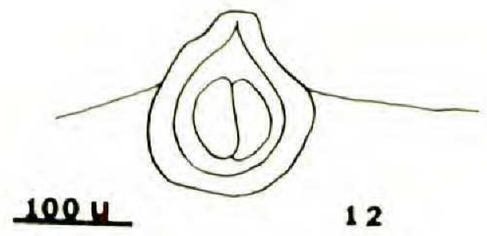








Figs. 1–3. *Stomatogene agaves*: 1. ascocarp, 2. ascus, 3. ascospores. 4–6. *Extrawettsteinina minuta*: 4. ascocarp, 5. ascus, 6. ascospores. 7–8. *E. pinastri*: 7. outline of ascocarp, 8. ascospores. 9–11. *Monascostroma pruni*: 9. outline of ascocarps, 10. ascus, 11. ascospores.



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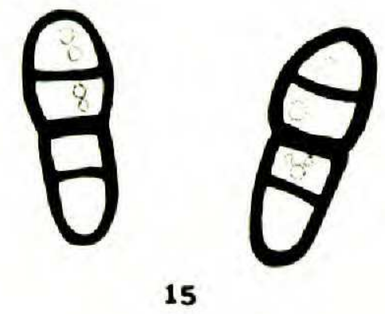

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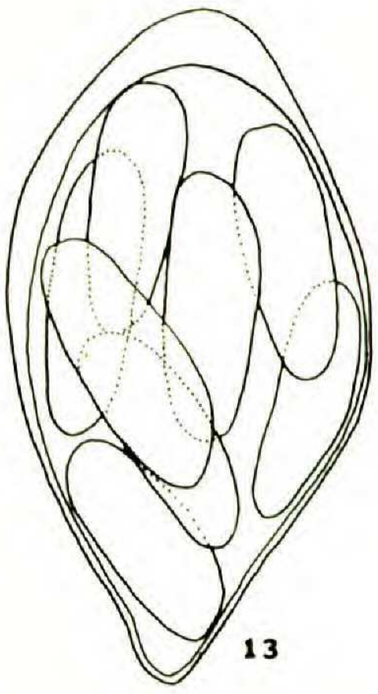

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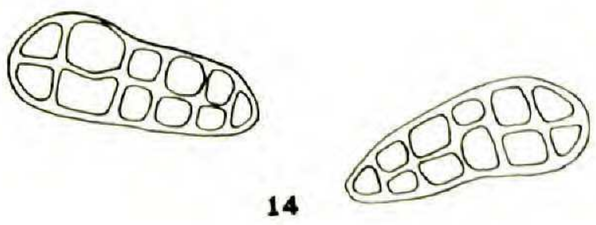

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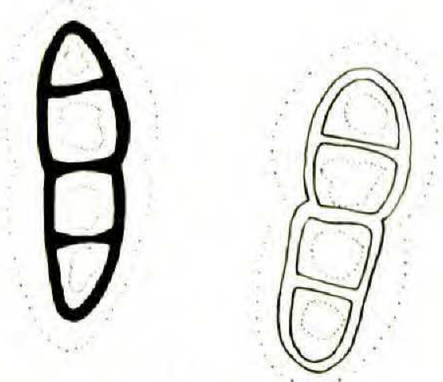

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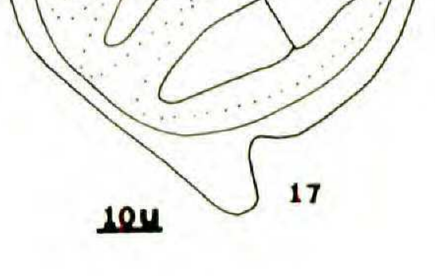

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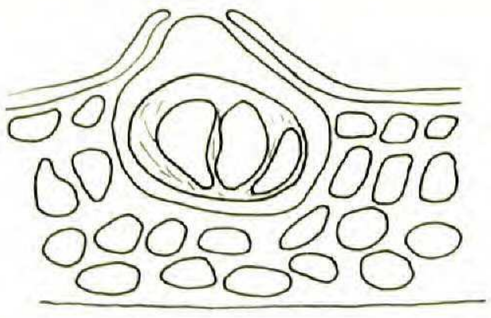

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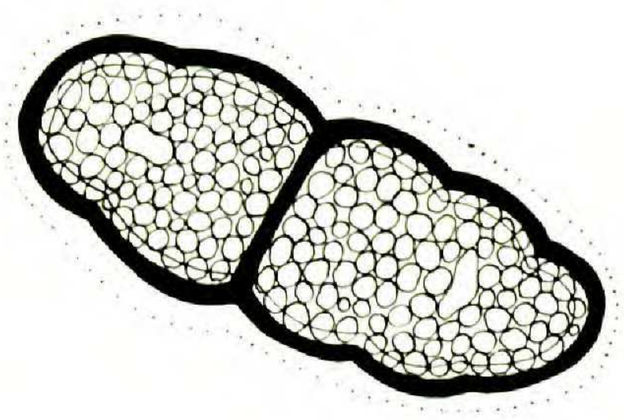

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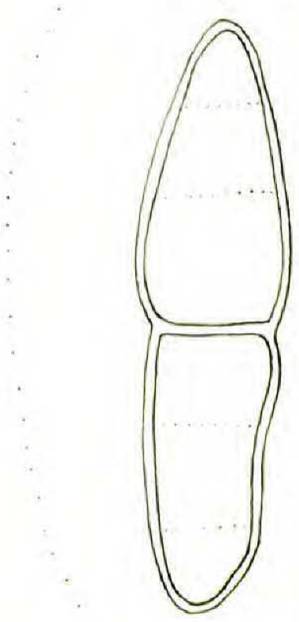

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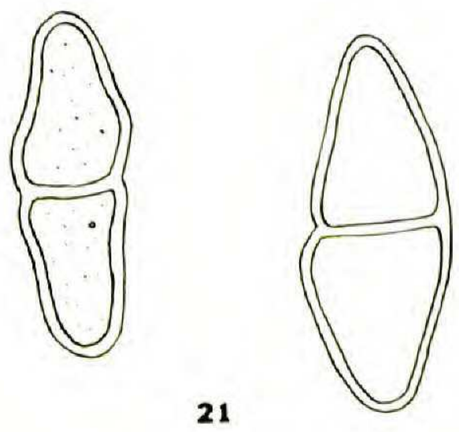

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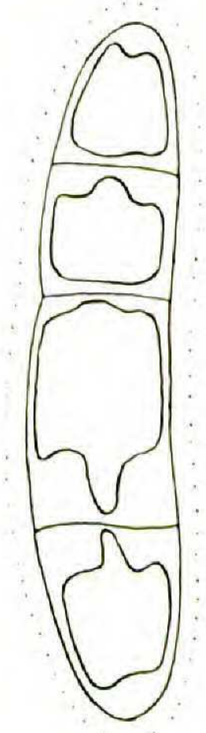

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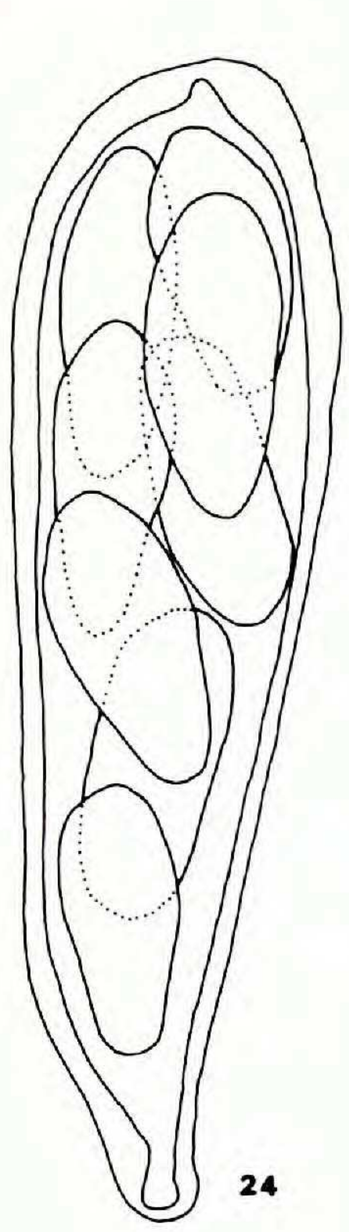
Figs. 12–14. *Leptosphaerulina pulchra*: 12. outline of ascocarp, 13. ascus, 14. ascospores. 15. *L. hyperborea*: ascospores. 16–18. *Wettsteinina mirabilis*: 16. outline of ascocarp, 17. ascus, 18. ascospore. 19. *W. gigaspora*: ascospore. 20. *W. ellisii*: ascospores. 21. *W. anomala*: ascospores. 22. *W. macrotheca*: ascospore.



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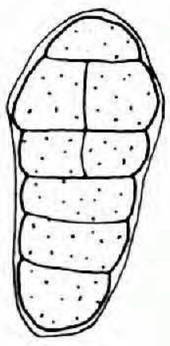

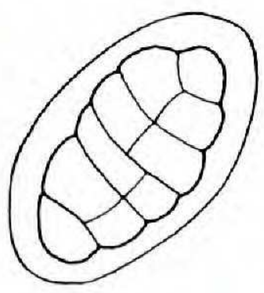

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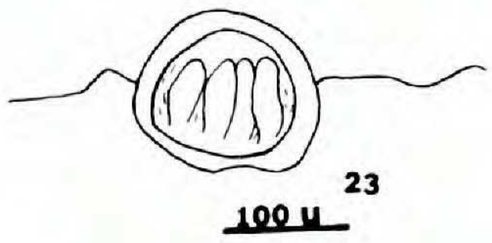

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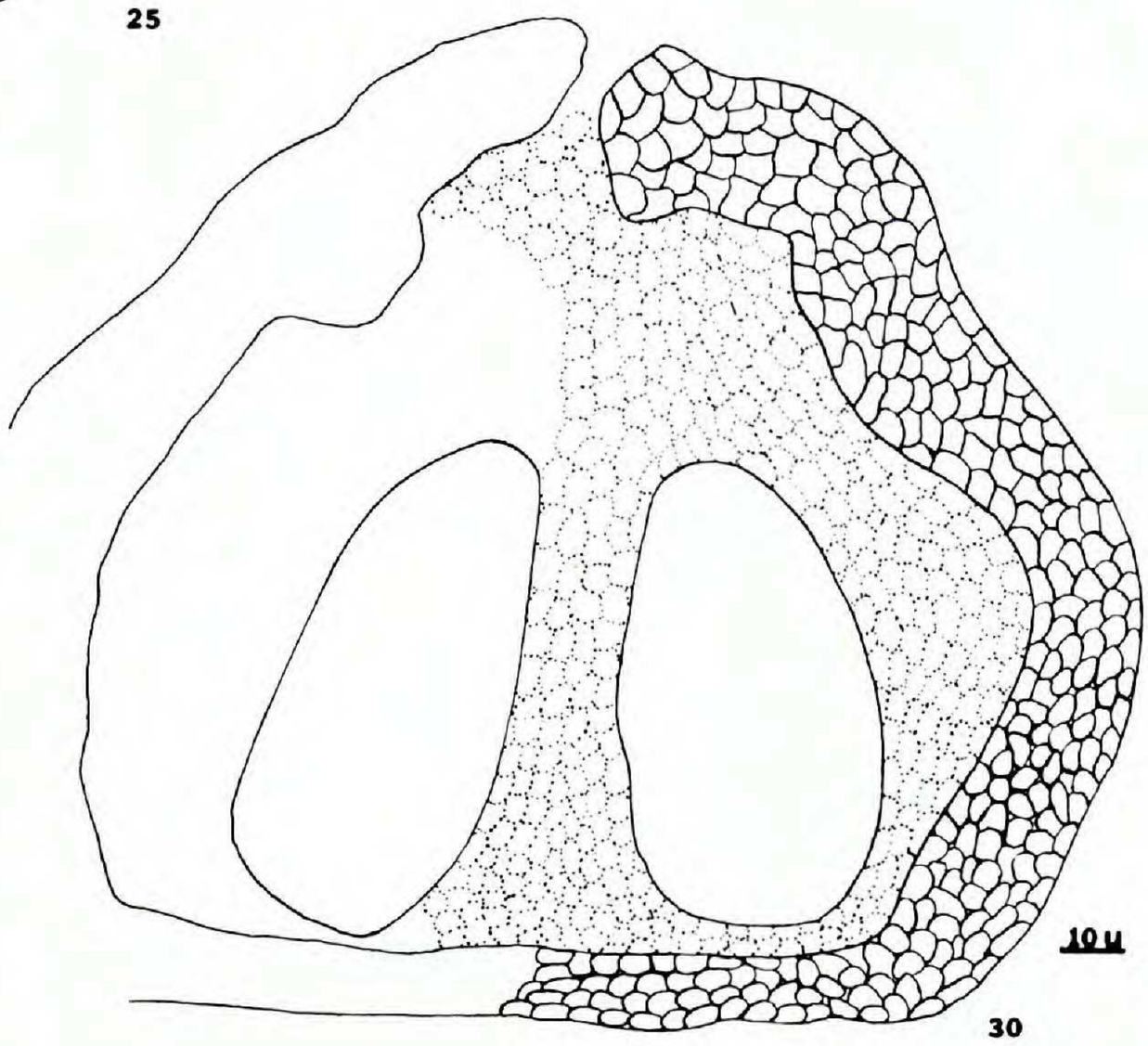

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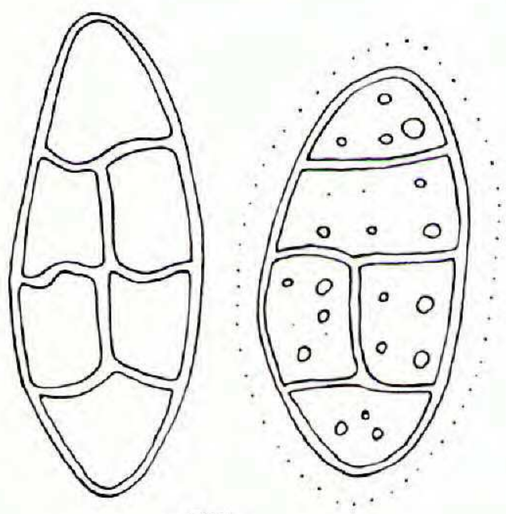

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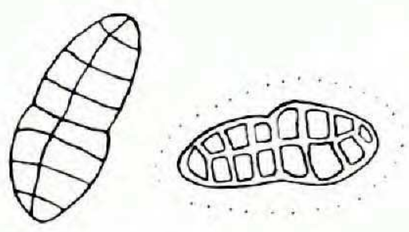

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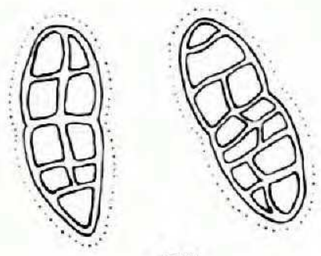

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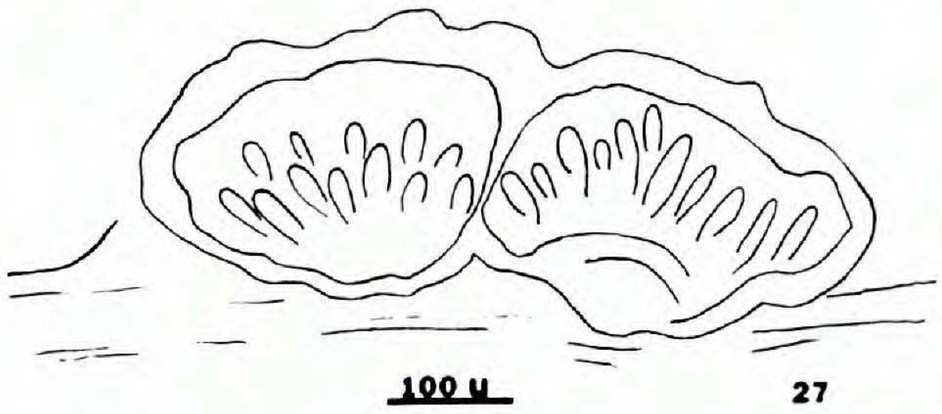

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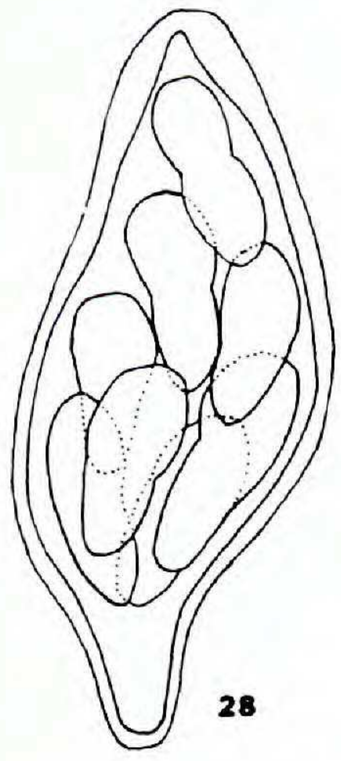

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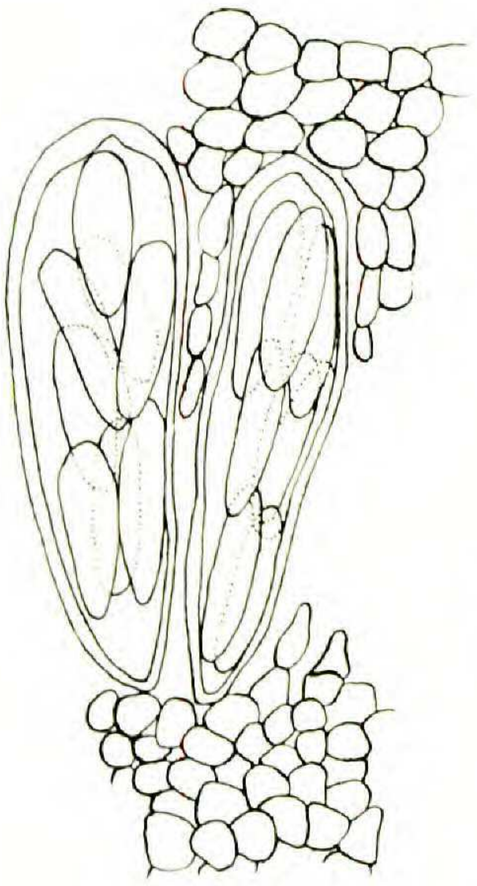
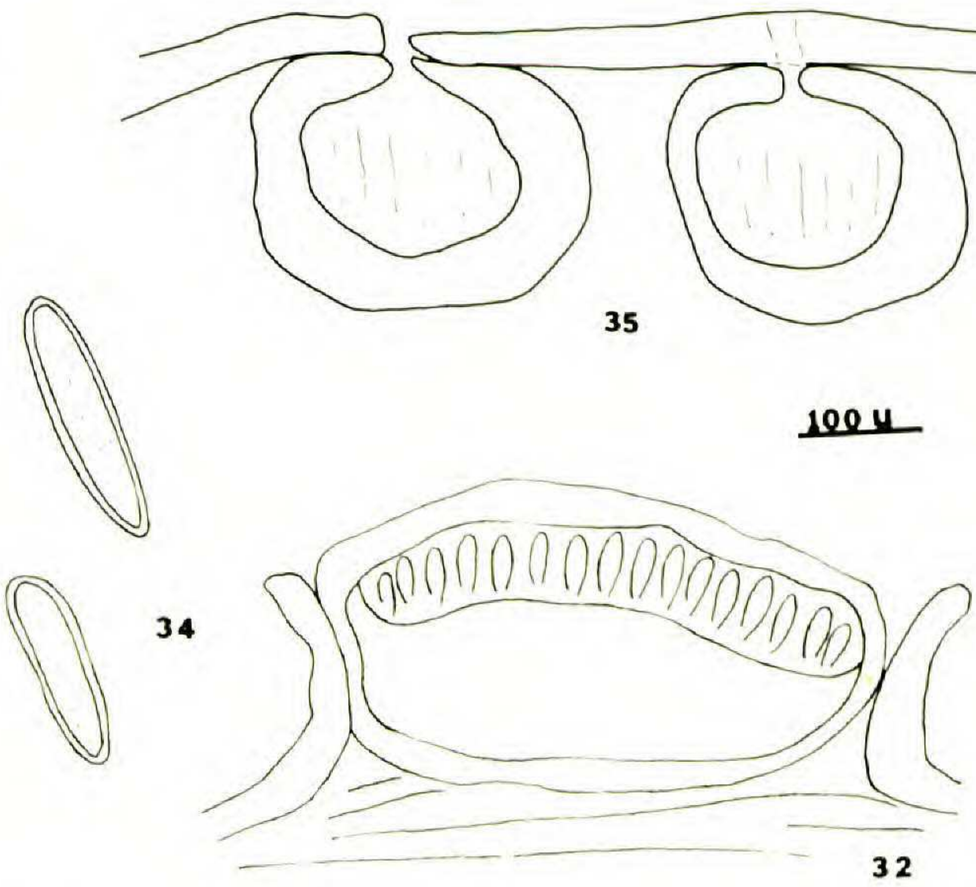
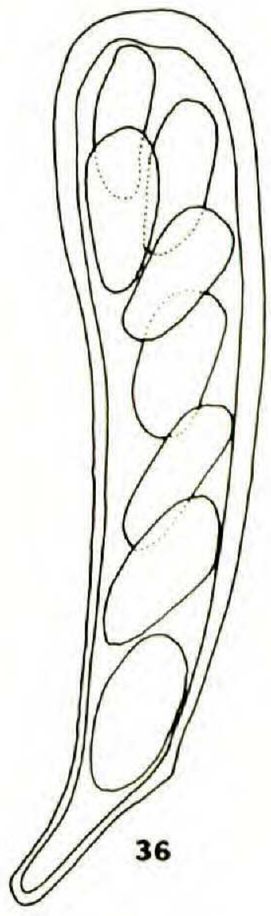
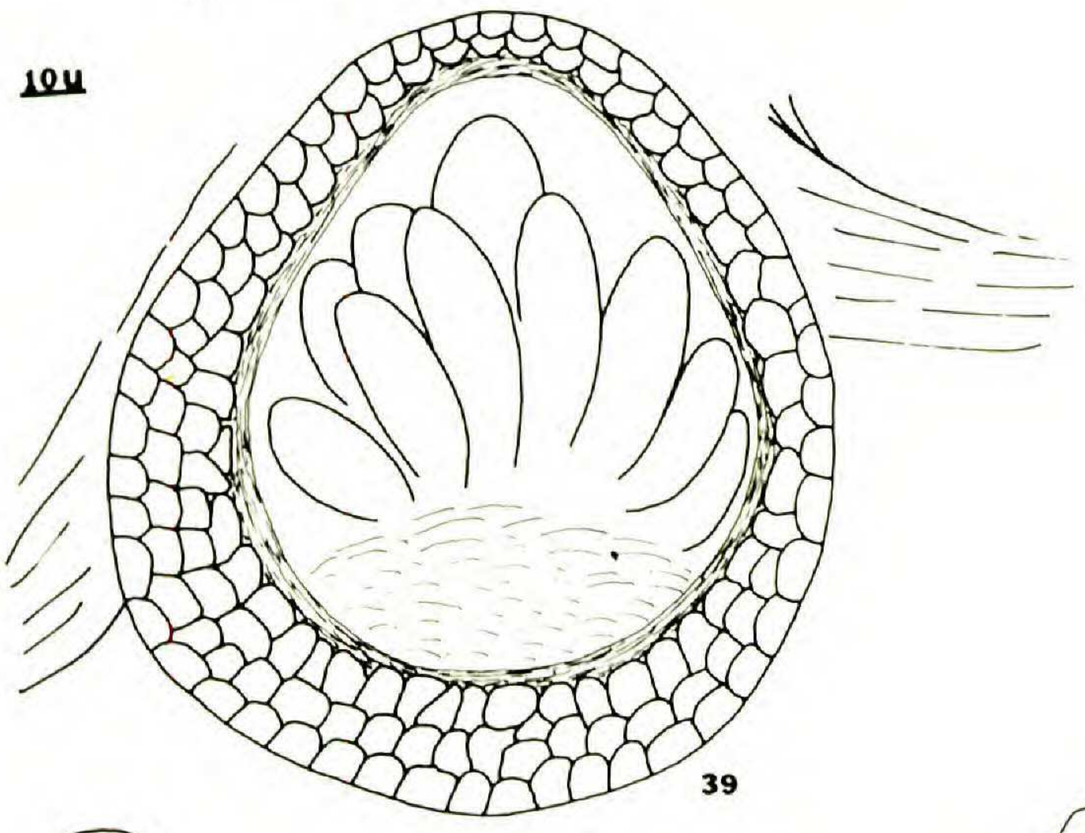
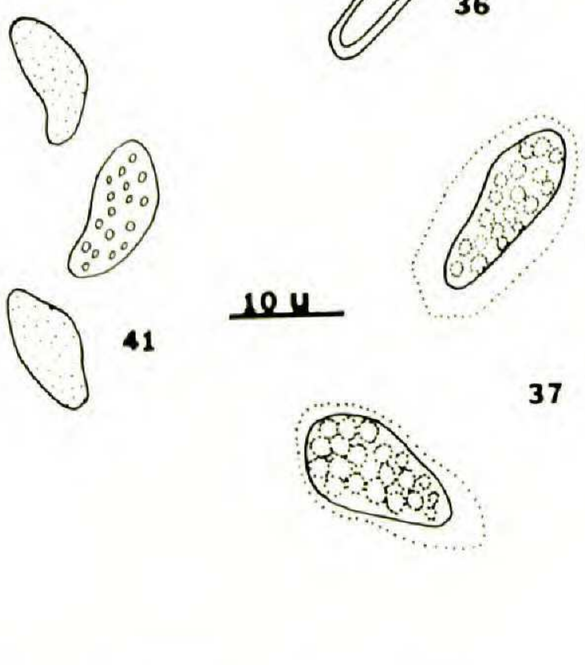
Figs. 23–25. *Pyrenophora scirpi*: 23. outline of ascocarp, 24. ascus, 25. ascospores. 26. *P. schroeteri*: ascospores. 27–29. *Dermatina elabens*: 27. outline of ascocarp, 28. ascus, 29. ascospores. 30–31. *D. pyrenocarpa*: 30. ascocarp, 31. ascospores.

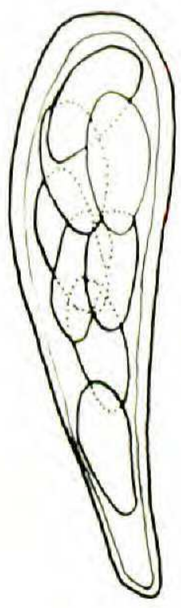


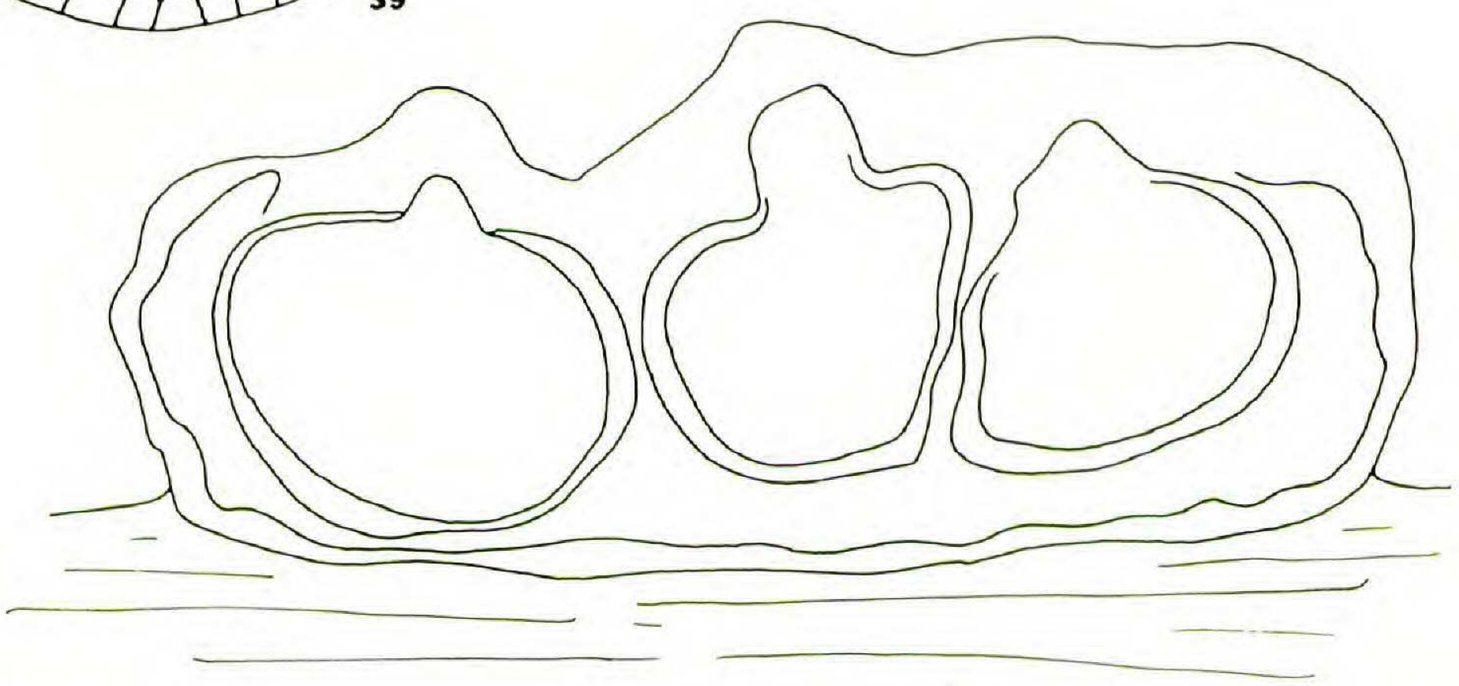




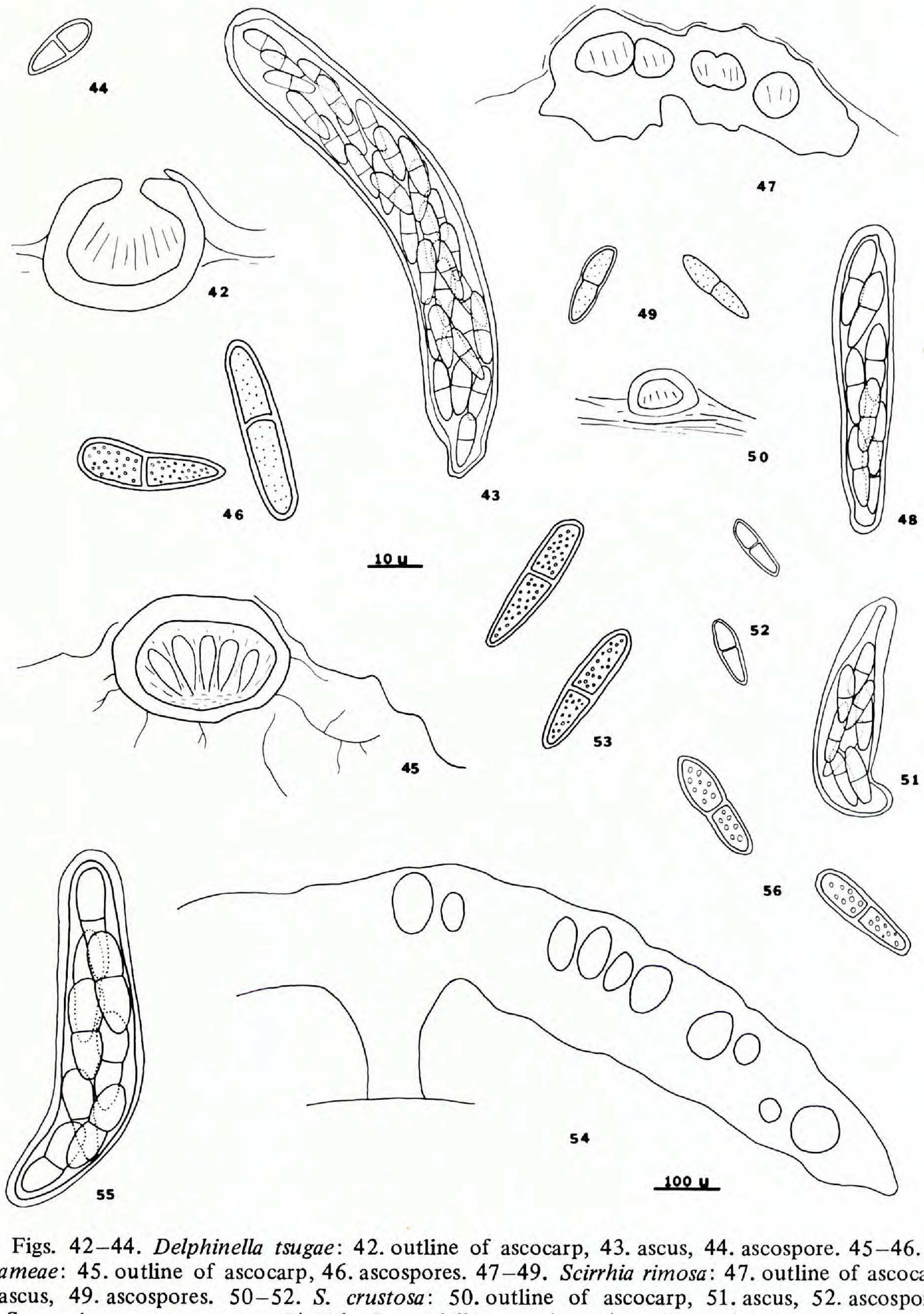




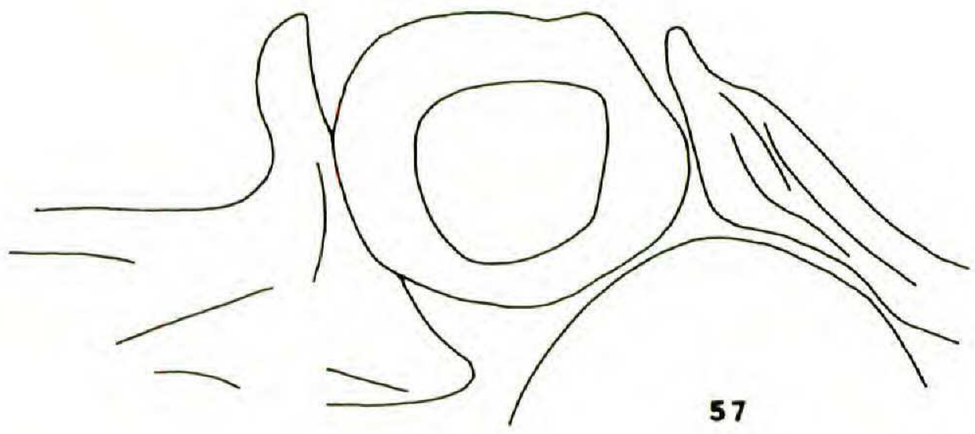




Figs. 32–34. *Bagnisiella australis*: 32. outline of ascocarp, 33. asci in locule, 34. ascospores. 35–37. *Botryosphaeria dothidea*: 35. outline of ascocarp, 36. ascus, 37. ascospores. 38. *B. quercuum*: outline of ascocarp. 39–41. *B. bidwellii*: 39. ascocarp, 40. ascus, 41. ascospores.



Figs. 42–44. *Delphinella tsugae*: 42. outline of ascocarp, 43. ascus, 44. ascospore. 45–46. *D. balsameae*: 45. outline of ascocarp, 46. ascospores. 47–49. *Scirrhia rimosa*: 47. outline of ascocarp, 48. ascus, 49. ascospores. 50–52. *S. crustosa*: 50. outline of ascocarp, 51. ascus, 52. ascospores. 53. *S. conigena*: ascospores. 54–56. *Coccoidella scutula*: 54. outline of ascocarp, 55. ascus, 56. ascospores.



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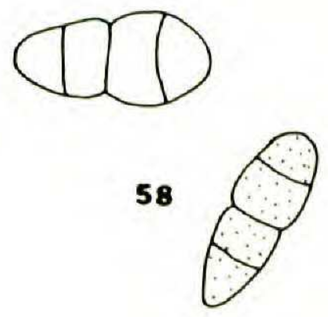

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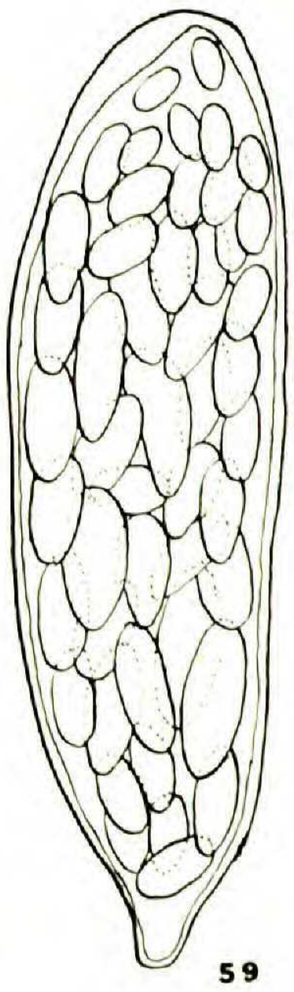

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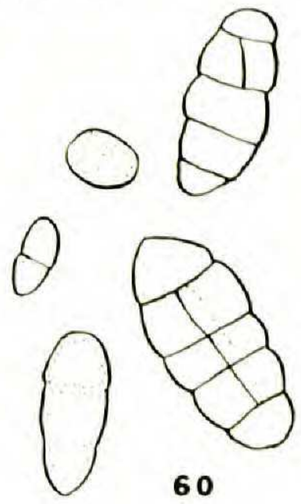

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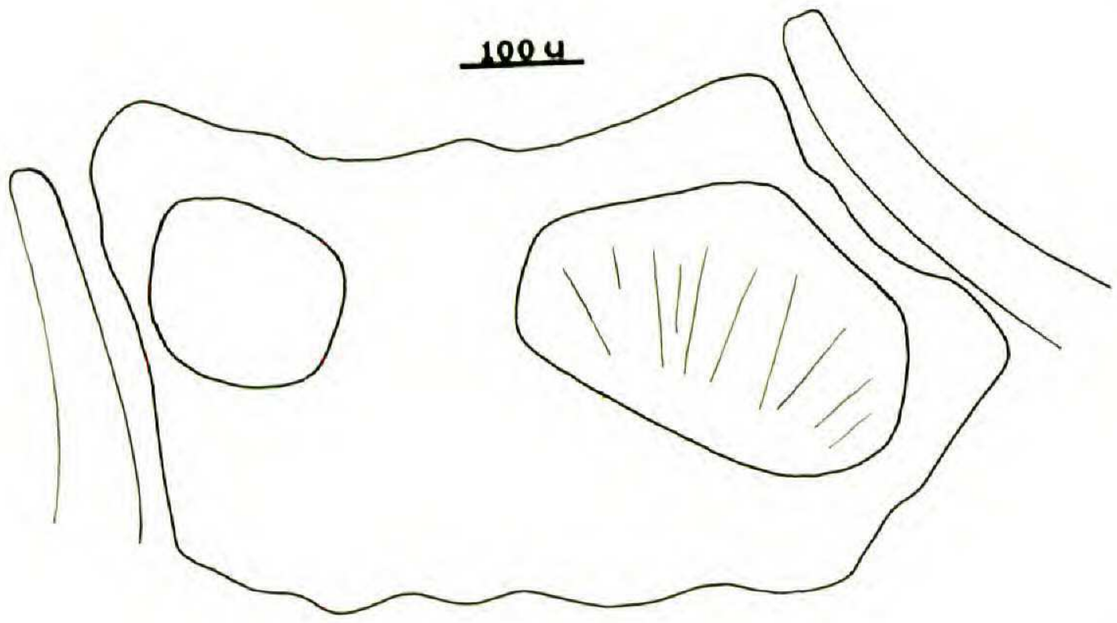

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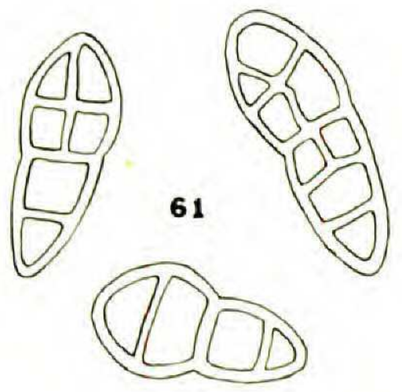

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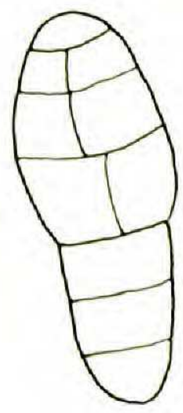

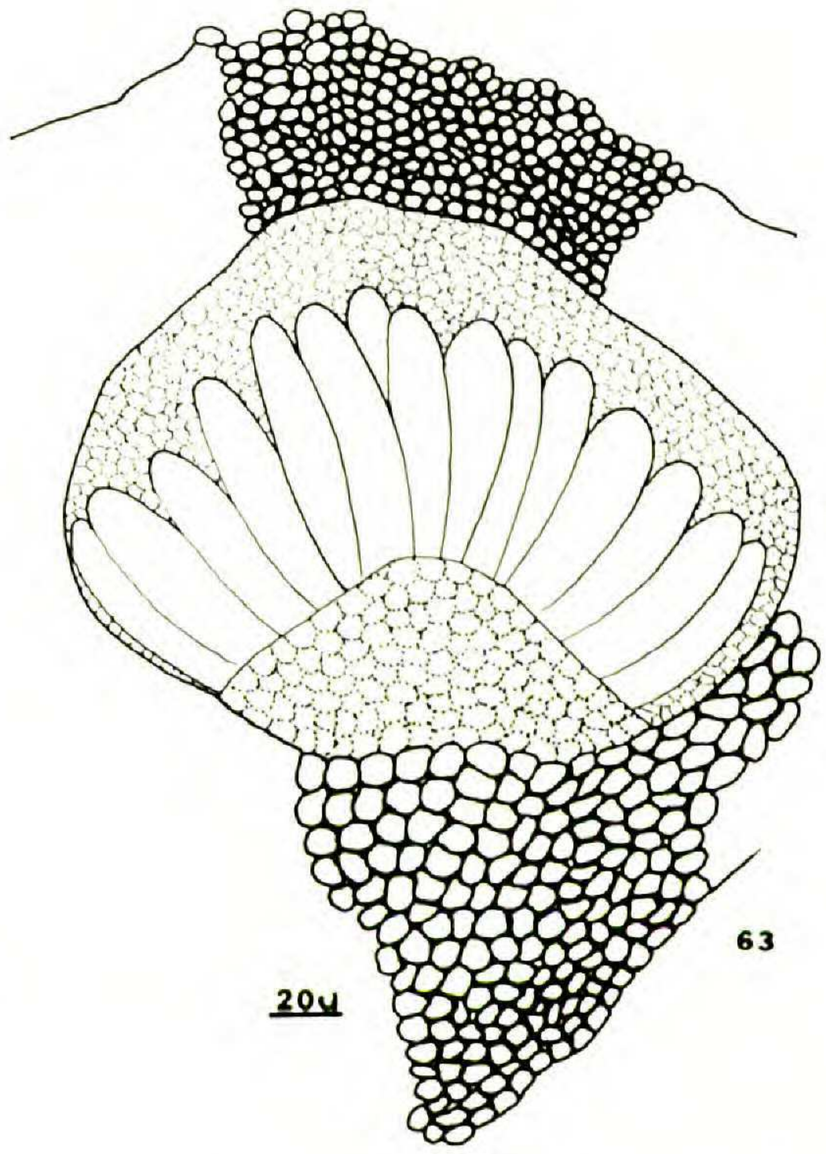

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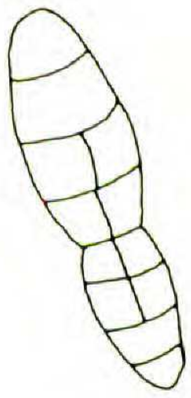

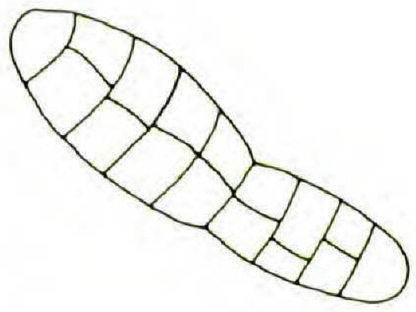

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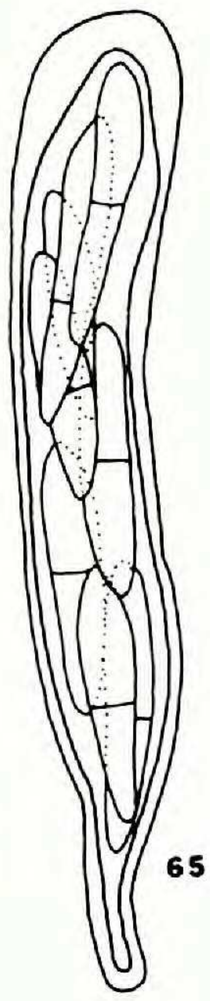
Figs. 57–58. *Sydowia polyspora*: 57. outline of ascocarp, 58. ascospores. 59–60. *S. versiformis*: 59. ascus, 60. ascospores. 61. *S. pruni*: ascospores. 62–64. *Dothiora pyrenophora*: 62. outline of ascocarp, 63. asci in locule, 64. ascospores.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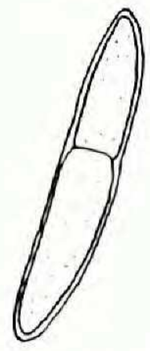
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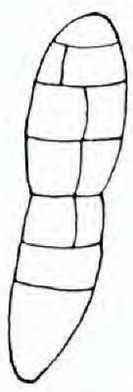

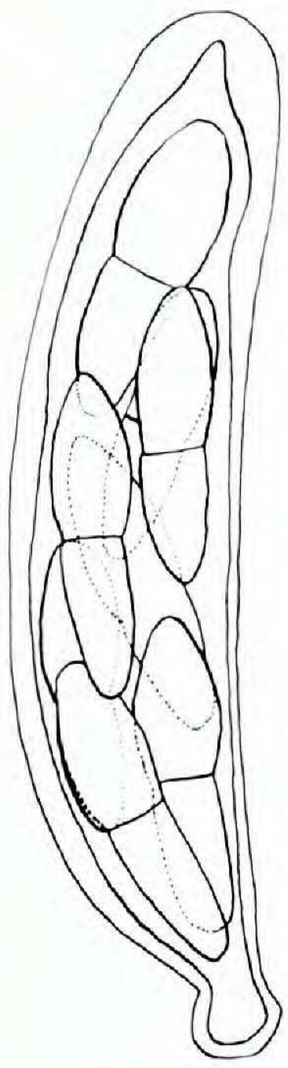
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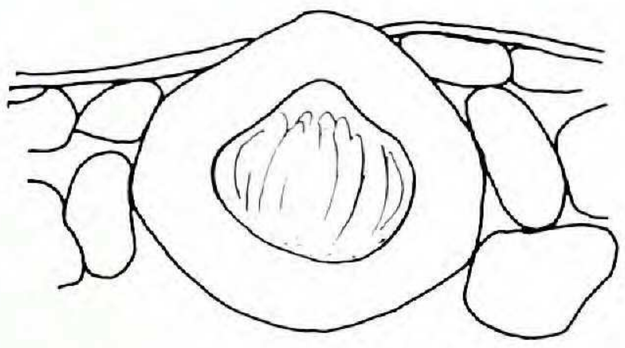
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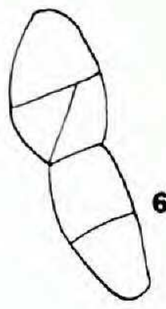
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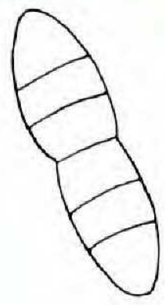

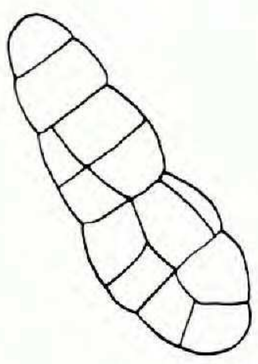


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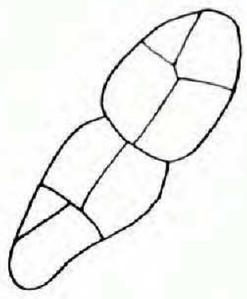

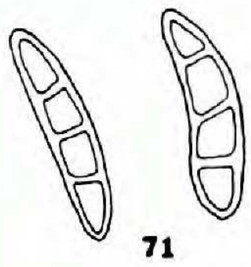
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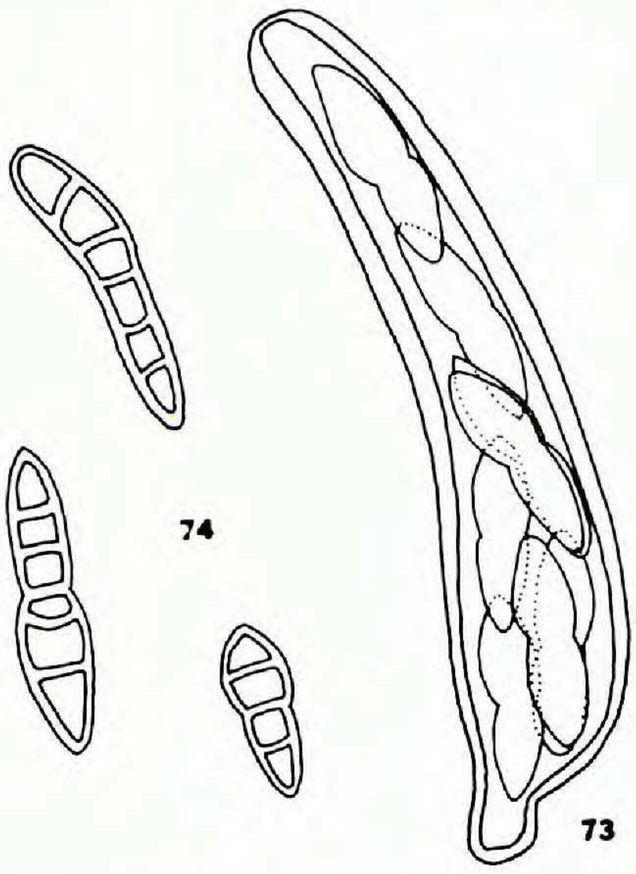
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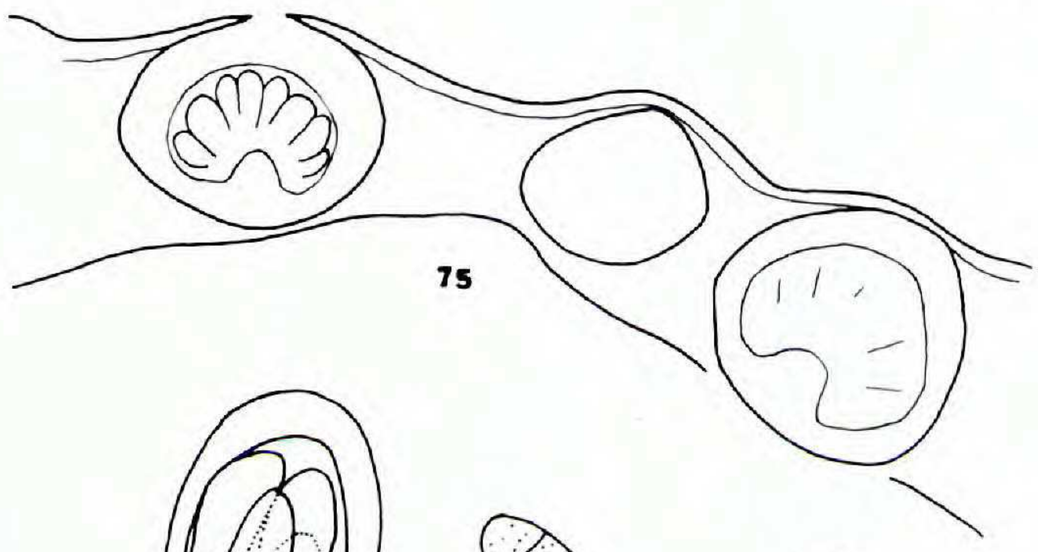
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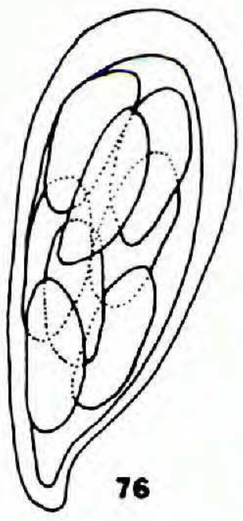
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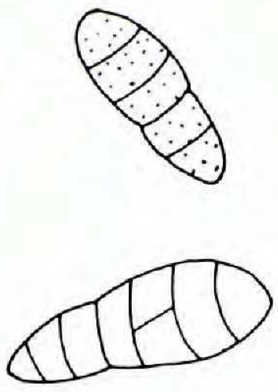
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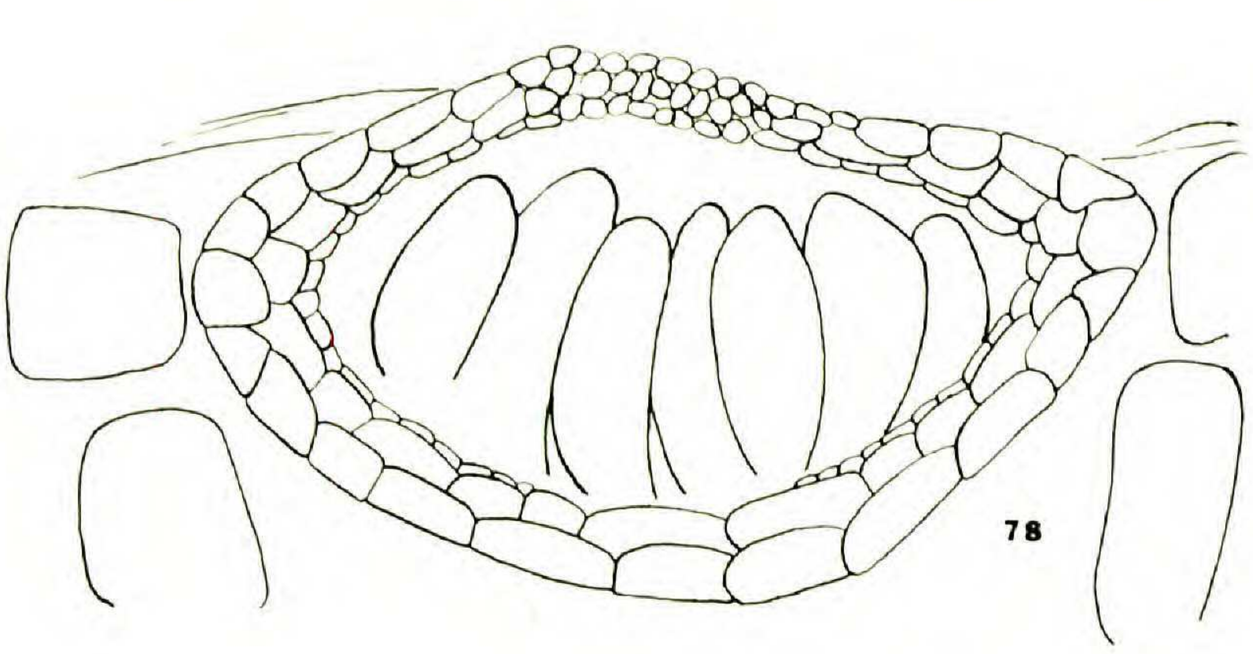
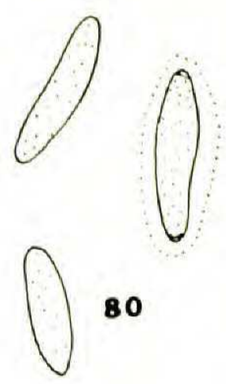
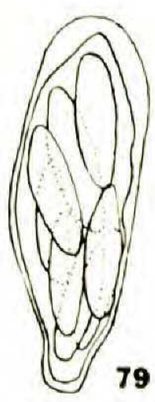
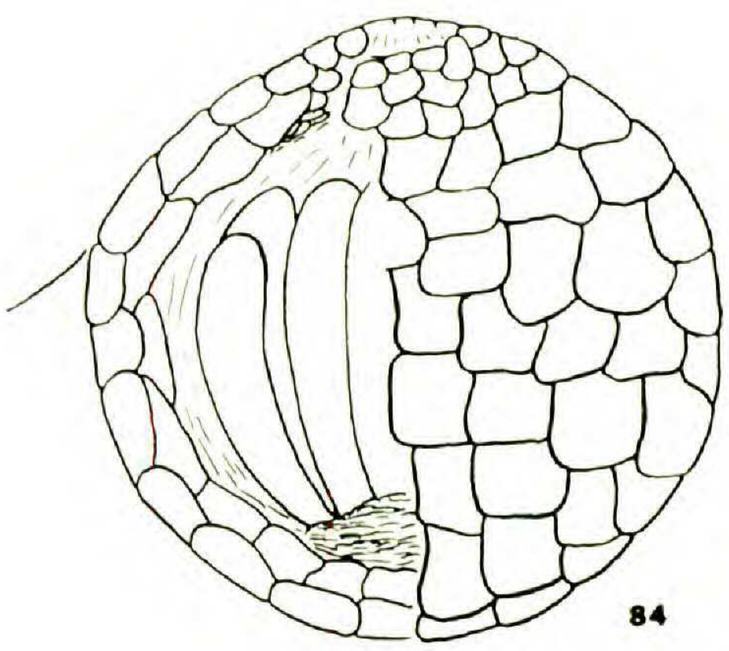
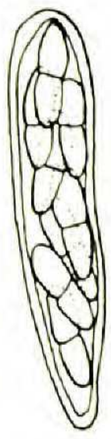
Figs. 65–66. *Dothiora ribesia*: 65. ascus, 66. ascospores. 67–69. *D. sambucina*: 67. outline of ascocarp, 68. ascus, 69. ascospores. 70–71. *D. taxicola*: 70. outline of ascocarp, 71. ascospores. 72. *D. thujae*: ascospores. 73–74. *D. wolfii*: 73. ascus, 74. ascospores. 75–77. *Saccothecium sepincola*: 75. outline of ascocarp, 76. ascus, 77. ascospores.

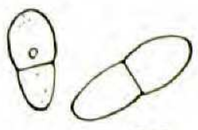


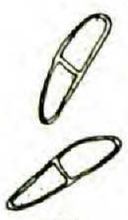


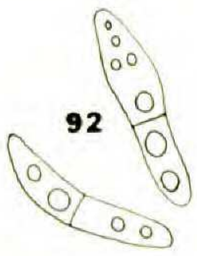


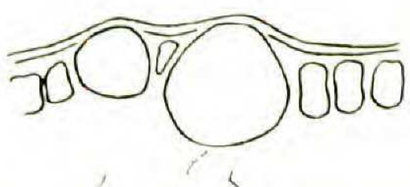


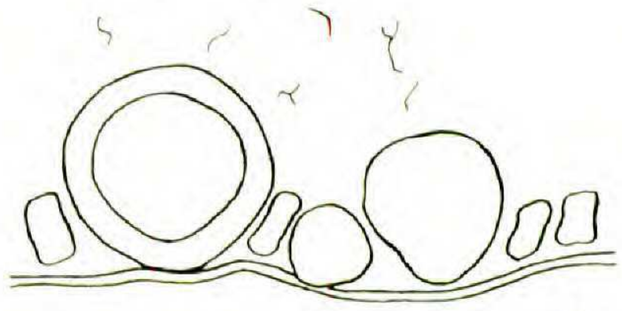


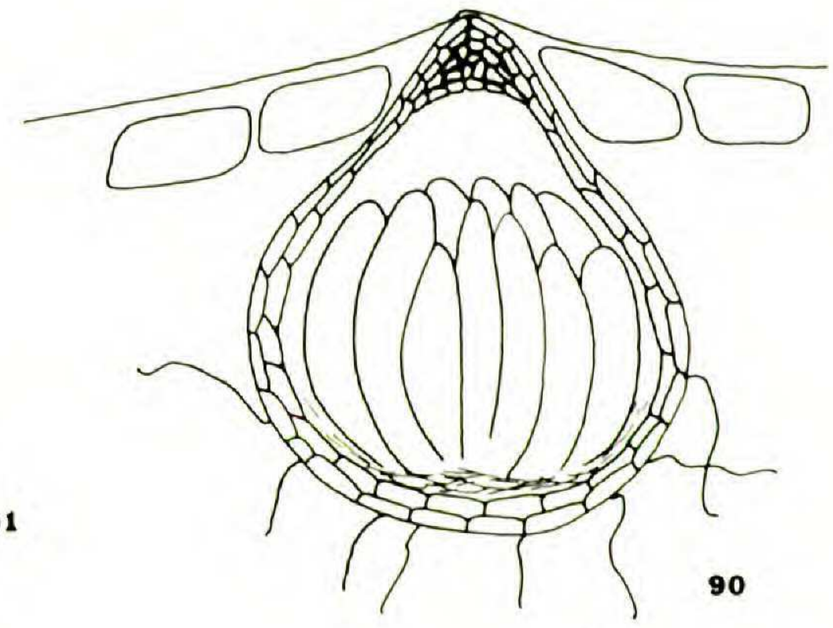


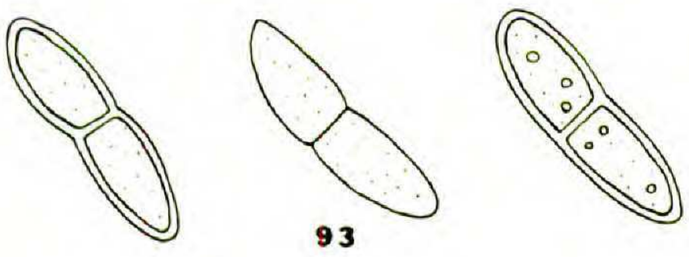




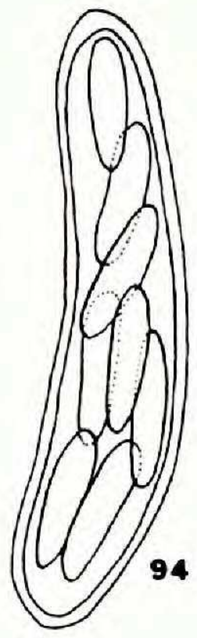








Figs. 78–80. *Discosphaerina fagi*: 78. ascocarp, 79. ascus, 80. ascospores. 81–83. *Omphalospora stellariae*: 81. outline of ascocarps, 82. ascus, 83. ascospore. 84–86. *Mycosphaerella punctiformis*: 84. ascocarp, 85. ascus, 86. ascospores. 87–89. *M. chimaphilae*: 87. outline of ascocarps, 88. ascus, 89. ascospores. 90–92. *M. coptis*: 90. ascocarp, 91. ascus, 92. ascospores. 93. *M. janus*: ascospores.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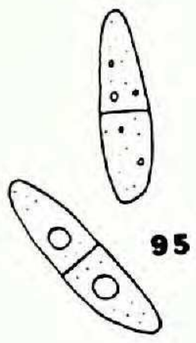
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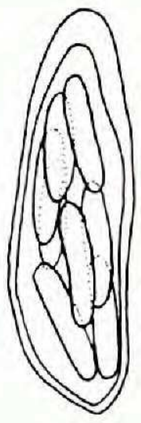
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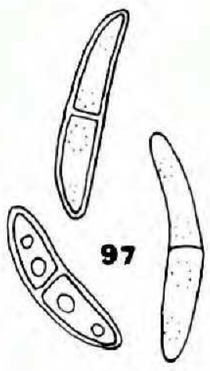
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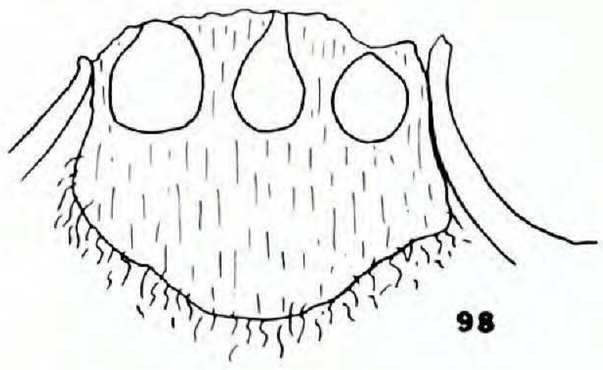
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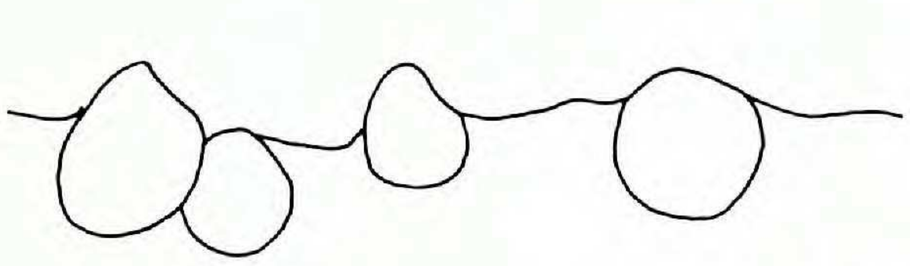
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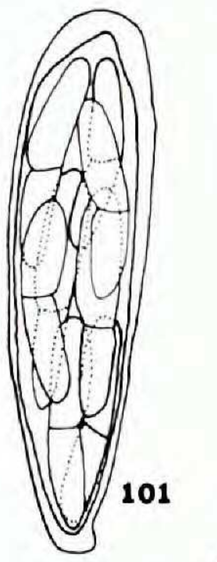
100 μ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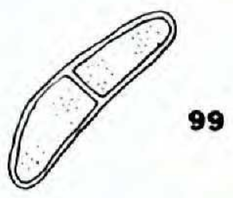
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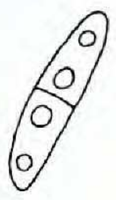

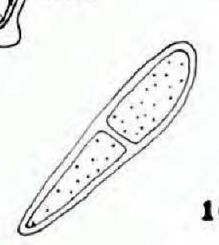
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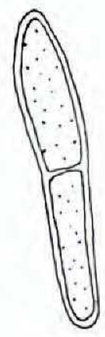

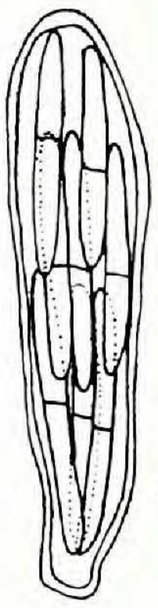
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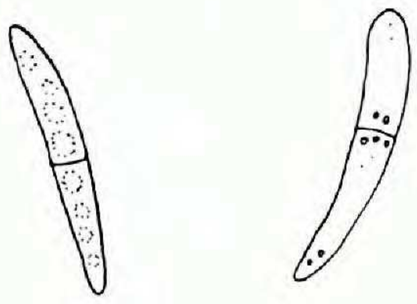


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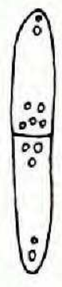
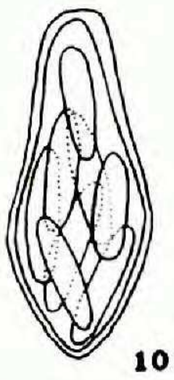


10 μ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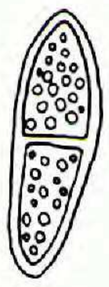
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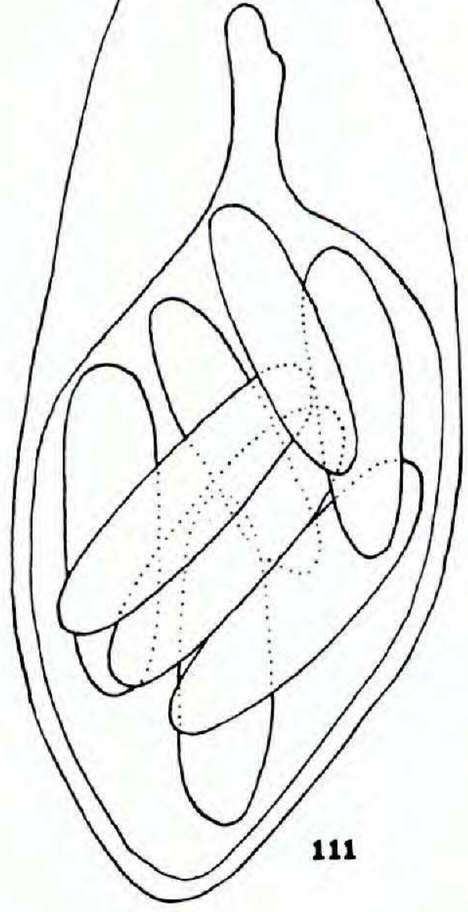
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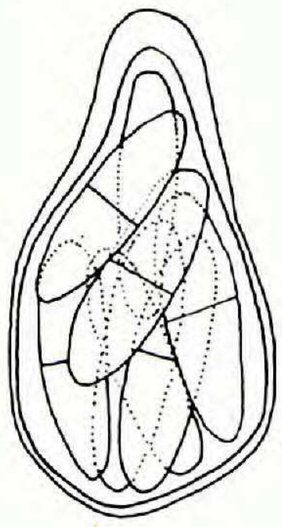
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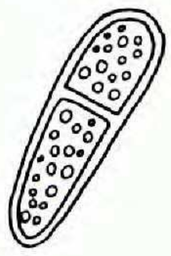

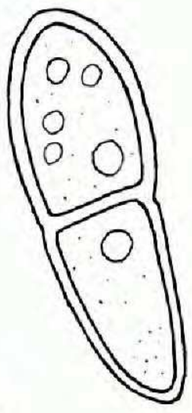

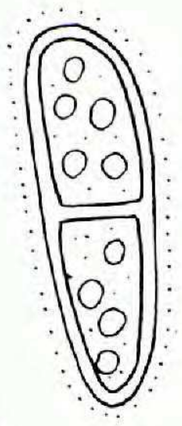
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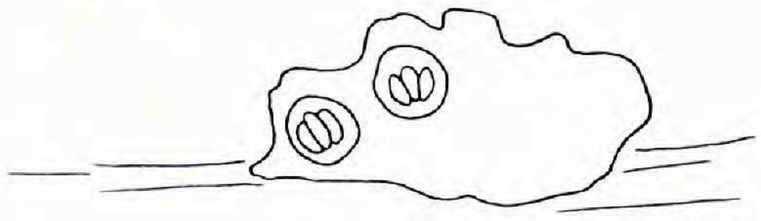
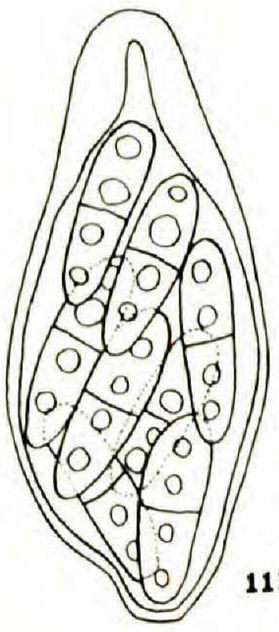

110

Figs. 94–95. *Mycosphaerella dearnessii*: 94. ascus, 95. ascospores. 96–97. *M. populorum*: 96. ascus, 97. ascospores. 98–99. *M. acervata*: 98. outline of ascocarp, 99. ascospores. 100–102. *M. ranunculi*: 100. outline of ascocarps, 101. ascus, 102. ascospores. 103–104. *M. linnaeae*: 103. ascus, 104. ascospores. 105. *M. alnicola*: ascospores. 106–107. *M. iridis*: 106. ascus, 107. ascospores. 108–109. *M. polifoliae*: 108. ascus, 109. ascospores. 110–112. *M. killianii*: 110. outline of ascocarp, 111. ascus, 112. ascospores.



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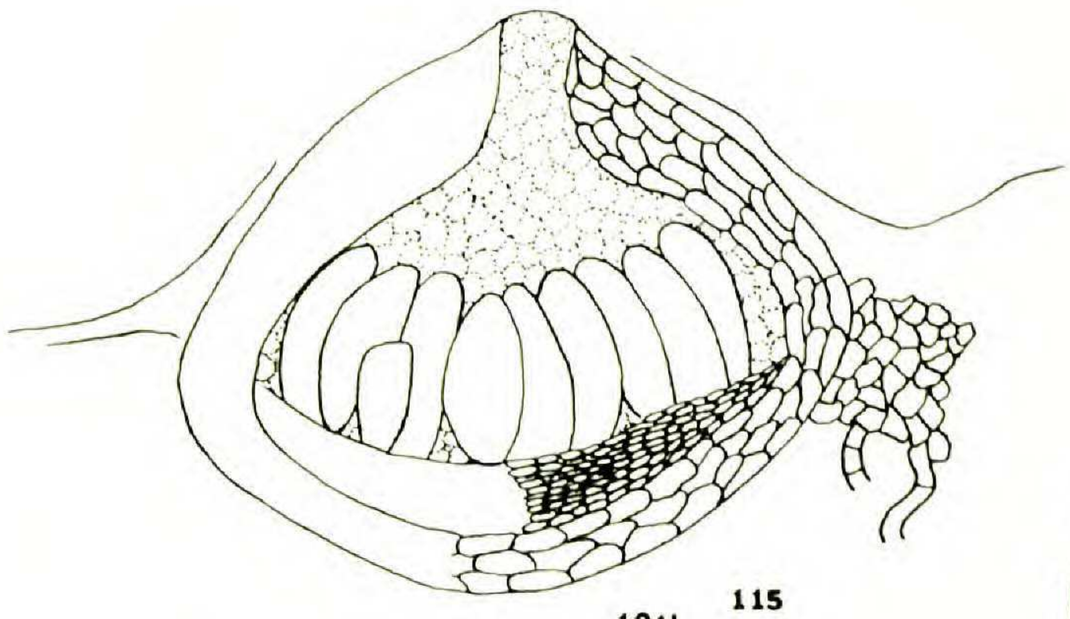
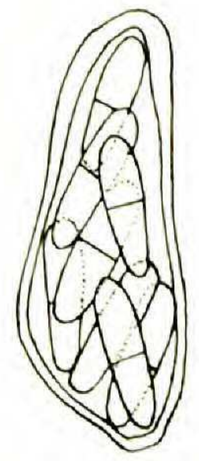


100 µ

115



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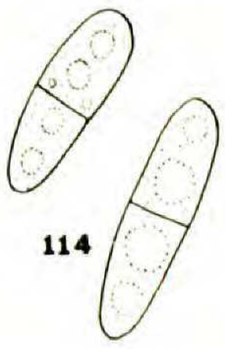

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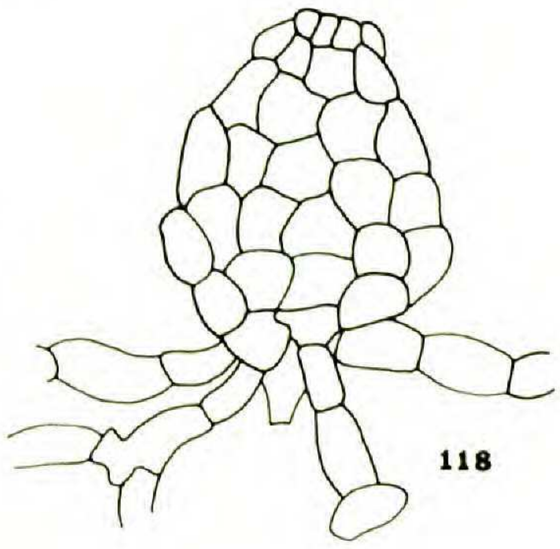

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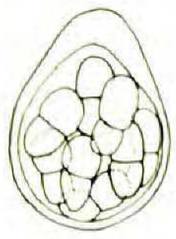

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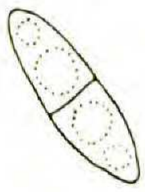

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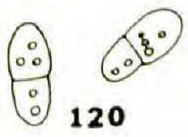

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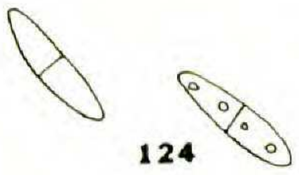

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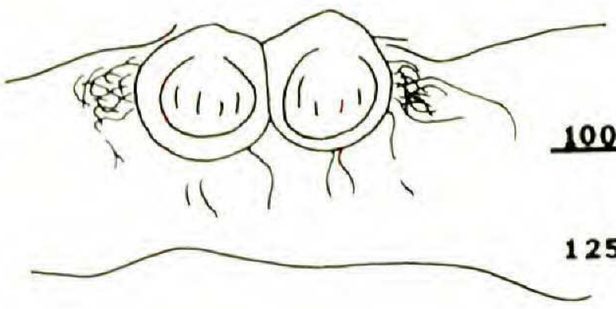
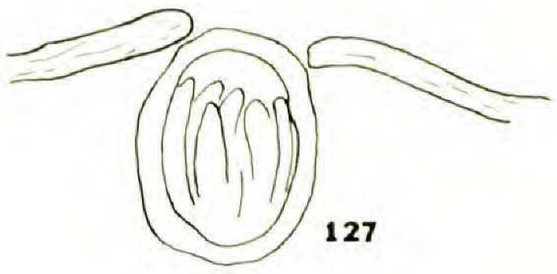


100 µ

125



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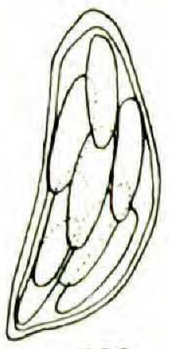

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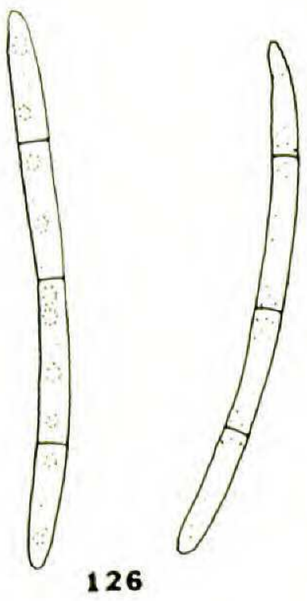

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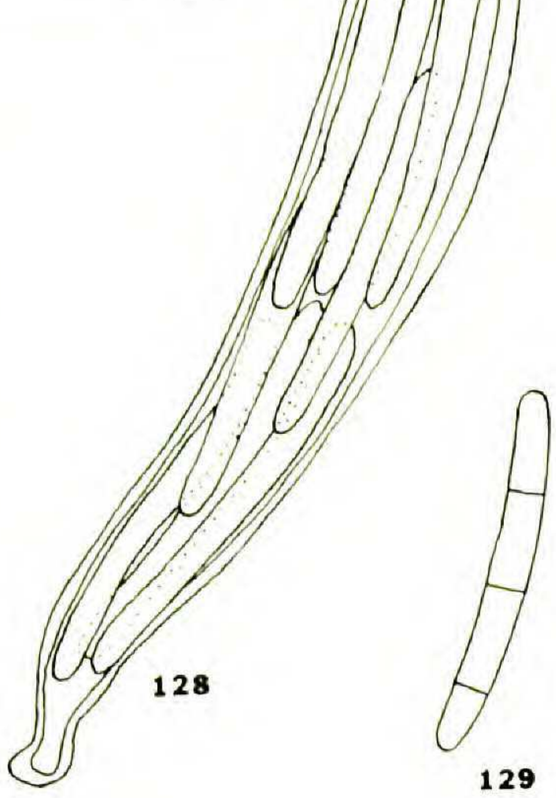

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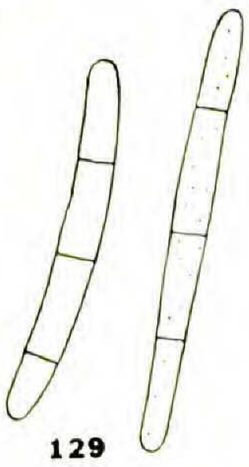

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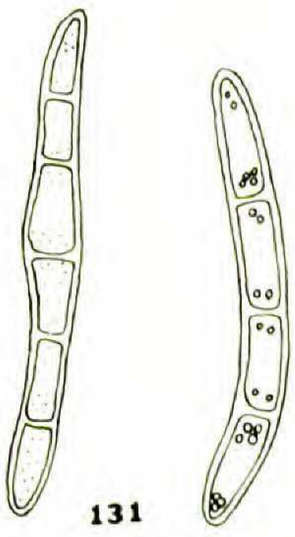
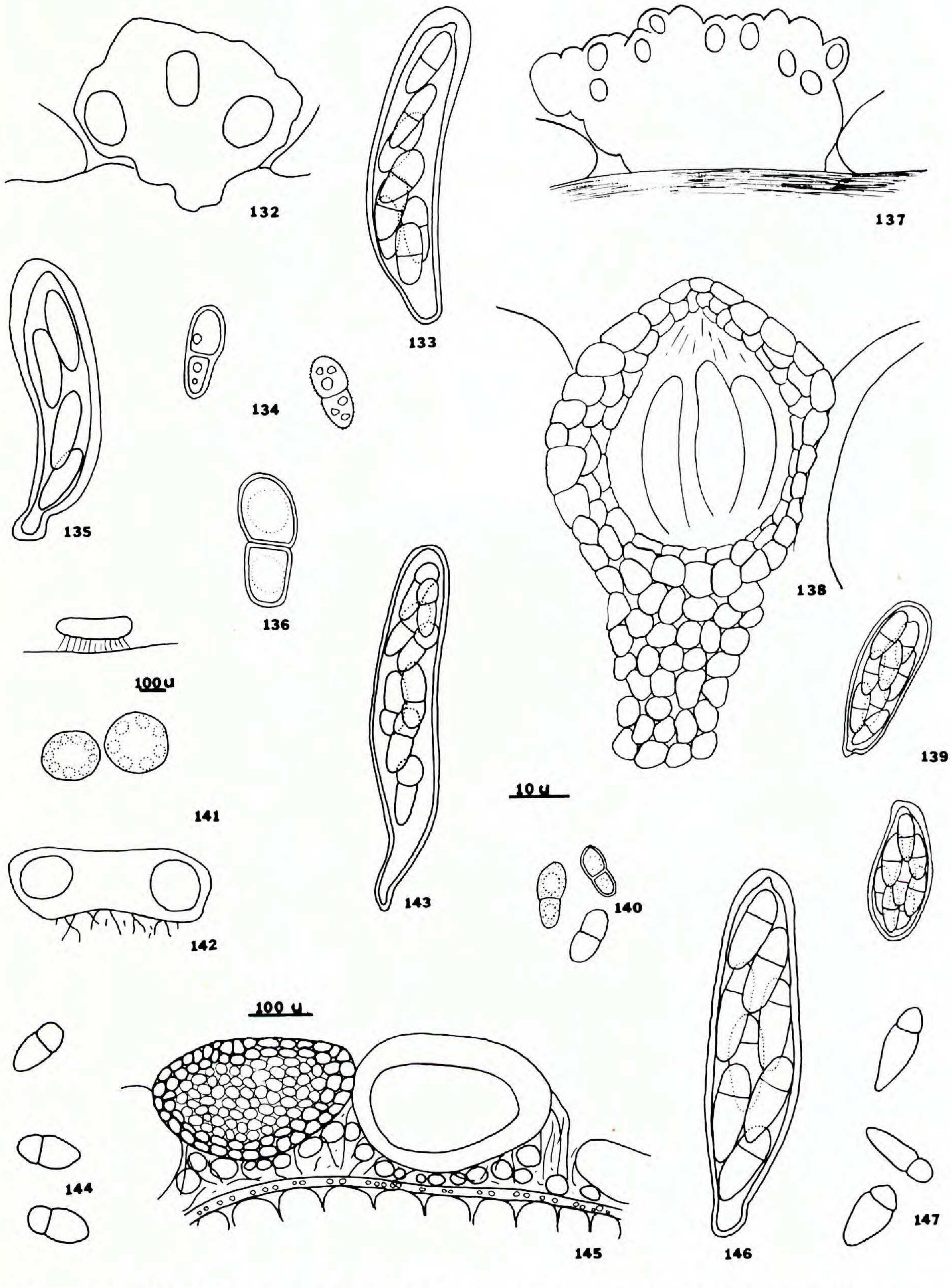
130



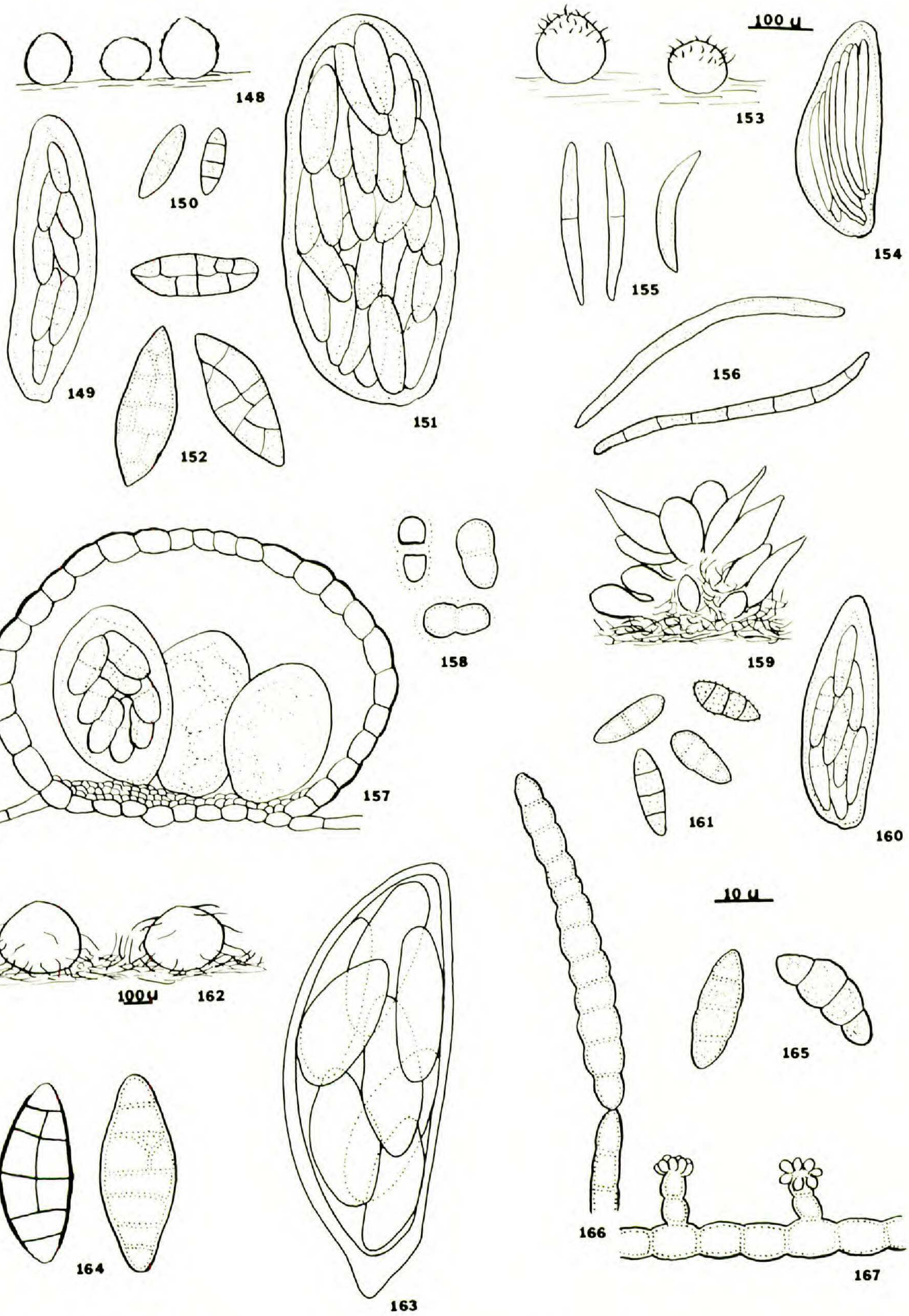
131

10 µ

Figs. 113–114. *Mycosphaerella tassiana*: 113. ascus, 114. ascospores. 115–117. *M. chenopodii*: 115. ascocarp, 116. ascus, 117. ascospores. 118–120. *M. minor*: 118. ascocarp, 119. ascus, 120. ascospores. 121–122. *M. lineolata*: 121. ascus, 122. ascospores. 123–124. *M. sphaerellula*: 123. ascus, 124. ascospores. 125–126. *Sphaerulina tarda*: 125. outline of ascocarp, 126. ascospores. 127–129. *S. conflicta*: 127. outline of ascocarp, 128. ascus, 129. ascospores. 130–131. *S. naumovii*: 130. ascus, 131. ascospores.



Figs. 132–134. *Dothidea sambuci*: 132. outline of ascocarp, 133. ascus, 134. ascospores. 135–136. *D. puccinioides*: 135. ascus, 136. ascospore. 137–140. *D. acerva*: 137. outline of ascocarp, 138. detail of locule, 139. asci, 140. ascospores. 141–144. *Rhizogene impressa*: 141. habit, side and top views, 142. outline of ascocarp, 143. ascus, 144. ascospores. 145–147. *Lasiobotrys lonicerae*: 145. outline of ascocarp, 146. ascus, 147. ascospores.



Figs. 148–150. *Herpotrichiella parasitica*: 148. outline of ascocarp, 149. ascus, 150. ascospores. 151–152. *Capronia irregularis*: 151. ascus, 152. ascospores. 153–155. *Polytrichiella albimontana*: 153. outline of ascocarp, 154. ascus, 155. ascospores. 156. *P. longispora*: ascospores. 157–158. *Rhytidenglerula carnea*: 157. ascocarp, 158. ascospores. 159–161. *Scorias spongiosa*: 159. outline of habit of ascocarps, 160. ascus, 161. ascospores. 162–164. *Strigopodia resinae*: 162. outline of ascocarp, 163. ascus, 164. ascospores. 165–167. *Aithalomyces alaskensis*: 165. ascospores, 166. phragmoconidium, 167. phialides.